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our communities

Pavement Management Strategic Plan

Transport Assets – Asset Management

August 2021



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Executive Summary

Victoria's arterial road and freeway network is a critical component of the State's economic infrastructure, generating and supporting significant economic and social benefits to the Victorian community.

Across Victoria, there are approximately 26,000 carriageway kilometres of arterial roads and freeways including ramps, over 3,180 bridges, over 4,800 other structures (major culverts, major sign structures, noise walls and retaining walls), more than 3,400 sets of traffic signals and other electrical systems such as street lighting and freeway management systems.

This complex asset base puts the Department of Transport (DoT) as one of Victoria's largest asset managers. The total pavement asset replacement value is \$31.8 billion plus additional \$9.2 billion for earthworks (figure current as of 30 June 2020). The movement of goods and people, made possible by a road network, creates wealth for individuals and corporations, and supports the delivery of services that aid social cohesion and economic development.

DoT is responsible for the planning, management and operation of the arterial road network on behalf of the Victorian Government. Agility and responsiveness are required to enable DoT to respond to dynamic conditions.

This Pavement Management Strategic Plan provides strategic direction for the determination of pavement maintenance and renewal requirements, where renewal includes both periodic resurfacing and pavement rehabilitation, to deliver value for money, achieve levels of service and define business outcomes.

This Pavement Management

Strategic Plan was developed in parallel with the finalisation of the Asset Management Strategic Framework. Any changes in the Asset Management Strategic Framework may drive further updates of this Pavement Management Strategic Plan. Some of the overarching content within this document, particularly from Sections 1 and 2, is intended to be incorporated into the Asset Management Strategic Framework.

Victorian transport objectives are articulated in the *Transport Integration Act 2010 (TIA)*. DoT is working with transport partners, Local Government and others to identify transport priorities and the role of the transport system in creating movement and place. This Pavement Management Strategic Plan seeks to support the key objectives as part of DoT's legislative responsibilities in the *Road Management Act 2004 (RMA)* and the *TIA*.

To assist with explaining how asset management functions relate to the statutory obligations, priorities and interventions, DoT is in the process of developing Asset Management Policy that will articulate asset management

principles, as shown in Figure 1. These asset management principles apply to all assets within the DoT portfolio and have been adopted to guide the Pavement Management Strategic Plan.

Key elements to the successful implementation of this strategic plan include:

- Targeted scenario modelling to inform investment needs;
- A collaborative partnership approach between Asset Management and Transport Services;
- Taking an integrated systems approach to Asset Management;
- Annual reporting of technical performance measures; and
- Understanding the interdependency of cost, Level of Service (LoS) and risk.

DoT will deliver core business activities to enable the realisation of the benefits associated with this strategic plan, as follows:

- 1 Adopt service focussed outcomes that support road safety, value creation, political and environmental objectives.
- 2 Collect data to inform evidence-based decisions regarding investment options.
- 3 Adopt predictive modelling techniques to assess network wide costs and benefits for different investment scenarios.
- 4 Prepare business cases for funding consideration that reflect the risk and LoS outcomes for pre-defined investment scenarios
- 5 Apply risk management and balance with levels of service, for optimal outcomes, within the constraints of the available budget.

- 6 Allocate activity-based funding to regions at a program level.
- 7 Leverage local expertise within regions for project level decision making, to empower accountable decision making and increase program efficiency.
- 8 Monitor performance to measure effectiveness of investment decisions, including output, service, access and financial performance metrics.
- 9 Deliver an annual works program that supports the pavement's program objectives and expected outcomes.
- 10 Manage delivery of works programs to achieve state-wide performance targets.
- 11 Adopt a learning culture to continually improve and evolve our planning processes.

DoT adopts a 10-year planning horizon to inform strategic decision making. For pavement and surfacing assets, DoT models ten year forward programs to inform investment decisions.

A consistent approach to investment scenario modelling will be adopted. DoT pre-defined scenarios to be considered as a minimum are:

- Current Investment
- Holding Condition Investment
- Sustainable Investment

DoT uses these strategic modelling outputs to develop a more detailed four year forward program. This four year forward program is then developed into an annual delivery plan.

The Director Asset Management will be responsible for implementation of the plan.

Implementation of the Pavement Management Strategic Plan will assist DoT to improve organisation wide asset management planning and enable more robust investment decision making.

Section 7 of this strategic plan summarises planned improvement initiatives that will further enhance pavement management outcomes and, by extension, enable improved service levels for road users.

Figure 1: DoT Asset Management Principles



1 / Context

1.1 Purpose

The Pavement Management Strategic Plan is to be applied by DoT and parties acting on DoT behalf, when:

- Determining maintenance and renewal requirements for pavement and surfacing assets across the Victorian arterial network;
- Developing forward works programs inclusive of prioritisation considerations; and
- Evaluation of modelling scenarios to inform preservation investment needs.

1.2 Objectives

The Pavement Management Strategic Plan seeks to support the key objectives as part of DoT's legislative responsibilities in the RMA and the TIA:

- Manage the asset portfolio to reinforce road safety;
- Optimise funding allocation to meet DoT strategic objectives;
- Enhance Pavement Management regime to meet service delivery needs; and
- Provide accessibility of data and information to make informed decisions.

The strategic plan also supports realisation of objectives within the Victorian *Financial Management Act 1994* and associated amendments.

1.3 Expenditure Types

DoT invests in many different types of programs. To enable the effective integration of planning processes, it is critical to demonstrate alignment across the business. Figure 2 illustrates the alignment between

DoT Sub-program Categories and Expenditure Types, including provision of pavement work activity examples for further context. The scope of this Pavement Management Strategic Plan document is shown by the yellow outline in Figure 2.

For details regarding DoT Sub-programs, reference should be made to the current Roads Program Guidelines.

Further detail regarding Expenditure Type definitions and examples are provided below for context.

1.3.1 Hazard Management

DoT understands the importance to provide a safe and efficient road network for use by all members of the public. DoT conducts hazard management activities to provide a road network that is as free from hazards as possible by regularly inspecting the network, identifying and removing hazards, undertaking minor repairs and by keeping the road network operating.

Hazard management aligns with the 'Maintaining the Network – Routine' investment sub-program classification, and it is captured under recurrent expenditure.

From an asset service capability point of view, hazard management can be separated into two different groups, which are operational activities and deterioration rate control activities. Refer to defect management (Chapter 6.1.4) to understand the typical types of activities.

Hazard inspection and response activities and requirements are outlined in the Road Management Plan (RMP) and translated into Standard Section 750. Standard Sections (e.g. Section 750) is a key guiding document for the operations and capital task management.

1.3.2 Defect Management

Defect management aligns with the 'Maintaining the Network – Routine' investment sub-program classification, and it is captured under recurrent expenditure.

From an asset service capability point of view, defect management can be separated into two different groups, which are operational activities and deterioration rate control activities.

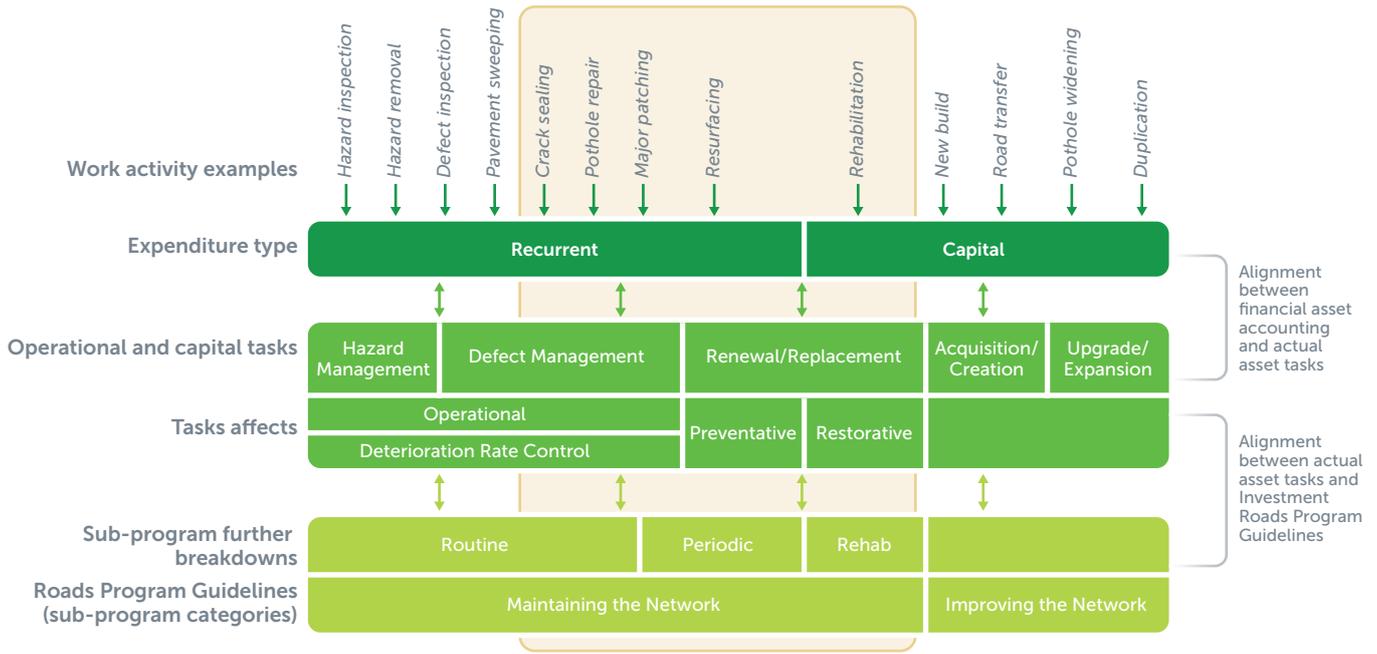
Operational activities do not impact asset deterioration rate or restore service capability. Those activities maintain a LoS to the road users from a safety, efficiency, access and operation point of view. The operational activities can be found in Standard Section 750, and some of those activities are listed below:

- Pavement cleaning
- Snow clearing
- Land slip cleaning
- Emergency works and services
- Vandalism repair
- Graffiti
- Litter control
- Line marking

Compared to operational activities, deterioration rate control activities have the added ability to slow down the slope of deterioration. Without defect management, pavement assets will deteriorate at a fast pace, which leads to premature failure. The activities can be found in Standard Section 750, and some of those activities are listed below:

- Pothole patching
- Crack sealing
- Water blasting

Figure 2: Scope of Pavement Management Strategic Plan



- Minor patching / dig outs (as defined within Standard Section 750)
- Edge break repair
- Shoulder grading
- Drainage clearing

Major patching is defined as 'greater than minor patching (as defined in Standard Section 750)' and 'less than 1000m² and maximum length of 200m'. While in certain cases, major patching works do have the ability to slightly restore pavement condition, the associated treatment unit cost is more expensive than the likes of pavement rehabilitation with less positive treatment effects.

Major patching should be categorised under defect management. Currently, from the DoT roads investment program point of view, major patching work is part of 'Maintaining the Network – Periodic'.

1.3.3 Renewal/Replacement

Renewal (component renewal, preventative)

Renewal treatments are designed to provide a rejuvenation affect to the asset which in turn restores its service capability. Different renewal treatments are triggered based on different intervention rules and have different treatment effects.

Component renewal minimises the rate and effect of deterioration and prevents the asset from entering the accelerated phase of deterioration. Timely intervention prevents asset from premature failure and hence removes the need for an earlier than required full restoration treatment, which in turn provides whole of life cost saving. Additionally, component renewal can restore the component condition and provide a better service with reduced likelihood of defect and hazard occurrence. Component renewal can be viewed as preventative in nature.

Component renewal in the pavement sense are in the form of, surface renewal treatments:

- Retexturing: typically describes water-blasting of the road surface to improve macrotexture (and hence surface friction).
- Resurfacing: describes the application of new sprayed seal or asphalt surface to improve all surface characteristics. Limited site preparation of the existing surface is sometimes required.
- Regulation: describes interventions that requires significant surface modification to address irregularities prior to the application a new surfacing.

Pavement component renewal works aligns with the 'Maintaining the Network – Periodic' investment sub-program classification, and it is captured under recurrent expenditure. Note, best asset management practice requires all costs associated with activities that have service capability improvement to be capitalised, and in this instance, component-based capitalisation.

Renewal (full asset renewal, restorative)

Full asset renewal refers to treatments where the asset service capability and condition status is restored to its original or modern-day equivalent. Full asset renewal is triggered when the asset is no longer meeting its LoS requirement and the condition have deteriorated beyond prevention measures. This work is restorative in nature.

In the pavement sense, full asset renewal refers to pavement rehabilitation. Rehabilitation describes the most invasive renewal treatment to replace or modify the existing base materials prior to the application of new surfacing. Rehabilitation returns the degraded service capability of the asset to its original designed capability or modern-day equivalent.

Pavement rehabilitation works aligns with the 'Maintaining the Network – Rehab' investment subprogram classification. Based on the current DoT asset accounting processes, rehabilitation is considered as capital expenditure. It is noted that some pavement rehabilitation is currently a mixture between recurrent and capital depending on the extent and level of works (ie final seals). Again, best asset management practice requires all costs associated with activities that have service capability improvement to be capitalised.

1.3.4. Replacement

In the pavement sense, replacement of pavement occurs as a reconstruction generally as an improvement project, increasing service capability beyond original design (e.g. widening). Therefore, pavement replacement is not captured as a renewal treatment, unlike other assets such as major culverts, retaining walls, noise walls where replacement falls under renewal.

1.3.5 Upgrade/Expansion

Upgrade and expansion works are associated with improving service levels in addition to the original designed capability or modern-day equivalent. Additionally, expansion works include activities that increases the original designed capacity of an existing asset or which creates new assets, to provide benefits to a new group of users. Upgrade/expansion is different to renewal which only improves degraded service capability within the boundaries of the original designed capability.

In relation to commonly used terminology in the road industry, upgrade works are often referred to as minor improvement works, while expansion works are often referred to as major projects.

Upgrade and expansion expenditure are discretionary in nature. Upgrade and expansion expenditure types are often reported together and referred to as Development works. Development expenditure will result in an immediate increase to operations and maintenance liabilities and an increase to future renewal liability, because of the increase in asset portfolio.

1.3.6. Acquisition/Creation

DoT can acquire existing built assets or create new assets in several ways, such as:

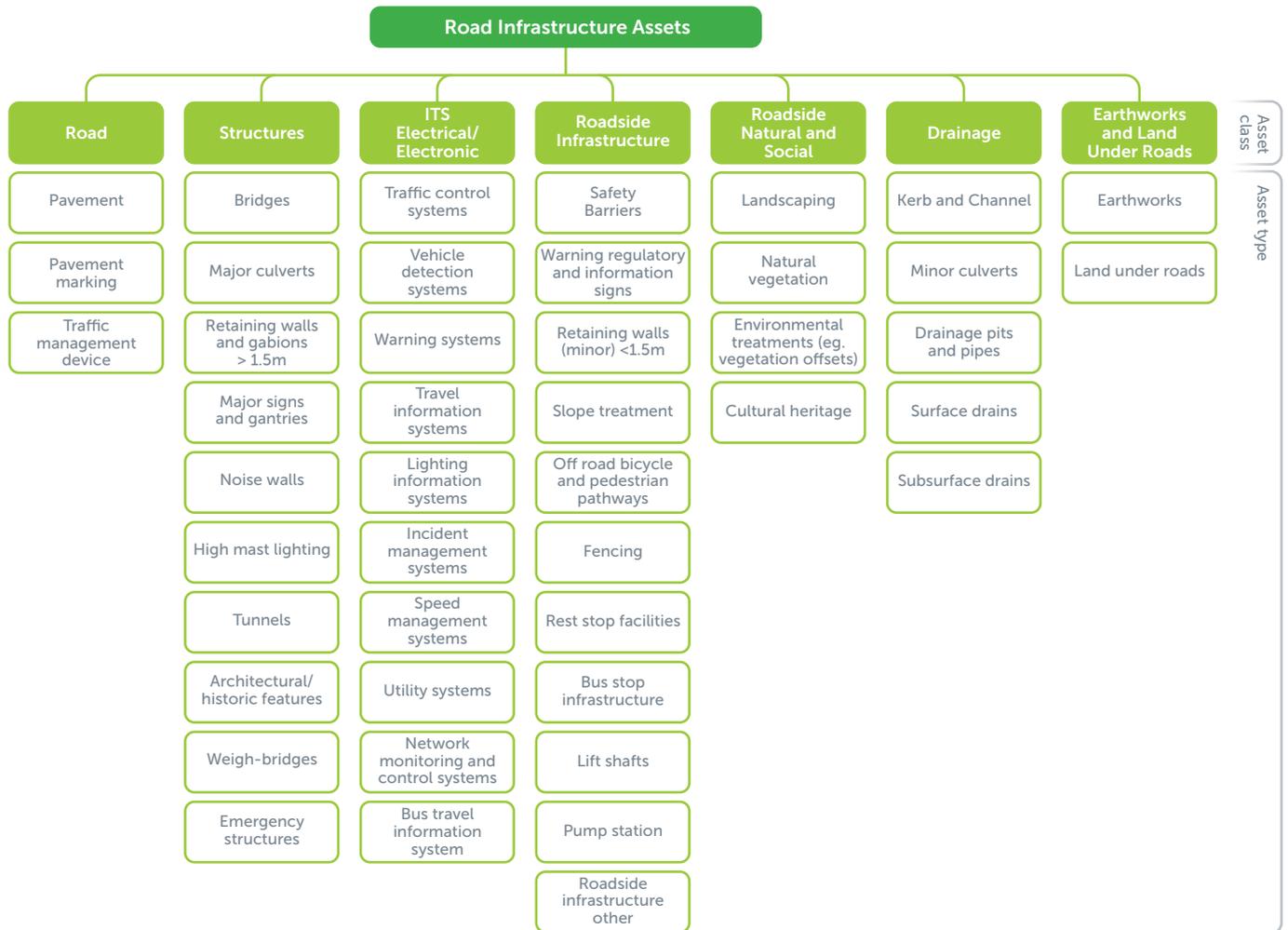
- Transferring ownership from and to a local authority or other party (such as land developers)
- Creation of assets via capital projects

All assets acquired are subject to asset handover process (acceptance / validation processes) to ensure that the asset meets DoT's standards.

1.4. Asset Hierarchy

DoT has adopted an asset classification structure to group asset types, as illustrated in Figure 3. This grouping of asset types enables the efficient development of preservation strategic plans, to cover all asset types within the road infrastructure systems asset class. This strategic plan is focussed on flexible pavements and pavement surfacing (including sealed shoulders) and associated formation/subgrade. The scope of this strategic plan excludes rigid and unsealed pavements as well as pavement markings.

Figure 3: Asset Classification Structure for Road Infrastructure Assets



1.5 Definitions and Acronyms

AMAF	An acronym meaning Asset Management Accountability Framework (AMAF). The AMAF was issued by the Victorian Department of Treasury and Finance in 2016. The AMAF outlines a series of principles and parameters which Responsible Bodies (e.g. DoT) and Accountable Officers (e.g. Head TfV) must establish to comply with the mandatory requirements for attestation.
AMS	Asset Management System
Asset Management	Asset Management is 'the coordinated activity of an organization to realize value from assets' (ISO 55000:2014). Asset Management is 'the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required LoS in the most cost-effective manner' (IPWEA IIMM 2015). <i>Note: IPWEA IIMM 2015 refers to the International Infrastructure Management Manual published by the Institute of Public Works Engineering Australasia.</i>
CAPEX	Capital Expenditure
DELWP	Department of Environment, Land, Water and Planning
DoT	Department of Transport
DTF	Department of Treasury and Finance
ERSC	Victorian Expenditure Review Sub-Committee
IPWEA IIMM 2015	IPWEA International Infrastructure Management Manual 2015.
IPWEA	Institute of Public Works Engineering Australasia.
ISO 55001	ISO 55001 is a document that specifies the requirements for an integrated, effective management system for asset management. <i>Note: ISO 55001 defines requirements for an asset management system (AMS), in the same way as ISO 9001 specifies a quality management system, and ISO 14001 covers an environmental management system. ISO 55001 is not, therefore, a specification for an asset information management system (AIMS) (sometimes called 'Enterprise Asset Management'). However, such software tools can be useful aids ('enablers') for information management and work control elements of good asset management.</i>
LoS	Level of Service
OPEX	Operational Expenditure
PMS	Pavement Management System
RACV	Royal Automobile Club of Victoria
RAS	Road Asset System
RMA	Road Management Act 2004
RMP	Road Management Plan
RMC	An acronym meaning Road Maintenance Category (RMC). DoT assigns an RMC category to each road section to assist with managing risk and LoS criteria, for road sections with different function and use characteristics.
Rural	'rural area' means, in relation to a road, an area that is not an urban area as defined in the RMA. Refer definition of Urban below. Further detail is provided in the <i>Operational Responsibility for Public Roads (S 174)</i> Code of Practice.
Scenario	A scenario is an investment option. Each scenario will result in a particular risk and LoS outcome. Scenarios are used to assist with making evidence-based assessments of options to balance the interrelated asset management elements of cost, risk and service level.
TIA	Transport Integration Act 2010.
TfV	Transport for Victoria
Urban	has the same meaning as in section 3(1) of the RMA, as follows: <i>'urban area' means, in relation to a road, an area in which:</i> (a) a speed limit of 60 kilometres per hour or less applies not being a speed limit which applies only because of a temporary reason such as roadworks or a street event; or (b) there are buildings on land next to the road, or there is street lighting, at intervals not exceeding 100 metres for: (i) a distance of at least 500 metres; or (ii) if the length of the road is less than 50 metres, over the length of the road; Further detail is provided in the <i>Operational Responsibility for Public Roads (S 174)</i> Code of Practice.
VAGO	Victorian Auditor General Office
WPMS	Works Performance Management System

2 / Strategic Alignment

2.1 DoT Priorities and Strategic Interventions

Victorian transport objectives are articulated in the TIA. DoT is working with transport partners, Local Government and others to identify transport priorities and the role of transport system plays in creating movement and place. DoT has developed a Strategic Plan which follows six strategic directions:

- Support all journeys and users
- Enable new travel patterns
- Maximise the opportunities created by technological advancements
- Service and network reforms that complement the Big Build
- Promote the transition to an environmentally sustainable transport network
- Test, trial and rapidly deploy improvements

DoT has identified seven priorities for 2020-2024 to assist in achieving the above directions, as follows:

- **Safe journey for all** – Operate a transport system that is safe and inclusive, and inspires confidence for all journeys and users
- **New travel patterns and places** – Deliver a people-focused system that enhances communities with sustainable new travel patterns, public and active transport and shared mobility services
- **Advanced technology and assets** – Leverage new technologies and optimise the performance of transport system assets
- **Service and network reforms** – Maximise and reform how transport policy, plans, infrastructure and services deliver social outcomes and drive economic recovery

- **Environment sustainability** – The transport network is public space that contributes to healthy, sustainable and liveable communities
- **Innovation through engagement** – Strengthen industry and community partnerships to test, trial and rapidly deploy improvements
- **Empower out people** – Continue to grow a safe, inclusive, high performance culture and organisation

2.2 DoT Management Responsibilities

In addition to the TIA objectives, DoT has specific management responsibilities under the RMA. The RMA articulates the role of a road authority in performing road management functions. Specifically, the RMA states that a road authority has general functions, as follows:

- (a) to provide and maintain, as part of a network of roads, roads for use by the community served by the road authority;
- (b) to manage the use of roads having regard to the principle that the primary purpose of a road is to be used by members of the public and that other uses are to be managed in a manner which minimises any adverse effect on the safe and efficient operation of the road and on the environment;
- (c) to manage traffic on roads in a manner that enhances the safe and efficient operation of roads;
- (ca) to design, construct, inspect, repair and maintain roads and road infrastructure;
- (d) to coordinate the installation of infrastructure on roads and the

conduct of other works in such a way as to minimise, as far as is reasonably practicable, adverse impacts on the provision of utility or public transport services;

- (e) to undertake works and activities which promote the functions referred to in paragraphs (a), (b), (c) and (ca) and to undertake activities which promote the function in paragraph (d).

2.3 Asset Management and Planning Documents Hierarchy

DoT is seeking alignment with the following industry asset management standards:

- **ISO 55001: Asset management** – Management systems – Requirements
- **AMAF: Department of Treasury and Finance Asset Management Accountability Framework**

To demonstrate the requirements of the above asset management standards, it is advantageous to demonstrate how core administrative instruments link together to deliver integrated planning outcomes. Figure 4 illustrates the DoT Hierarchy of Asset Management and Planning Documents. This document hierarchy does not include all administrative instruments required to administer whole of business asset management functions. Rather, it incorporates core documents considered necessary for DoT to conduct integrated business planning in accordance with the AMAF and ISO55001. This document hierarchy demonstrates how asset management planning documents link with the business area planning process and associated budget bid documentation.

A number of the required Foundation and Strategic Planning documents shown in Figure 4 are under development, as part of DoT Asset Management Capability Improvement.

Figure 5 provides further detail regarding documents covered within Operations, Preservation and Development Strategies, in order to demonstrate how this document fits into the DoT Asset Management System (AMS).

DoT develops separable Operations, Preservation and Development strategic plans in order to differentiate between different program objectives. It is important to note that operational business areas are expected to work together to identify opportunities to combine projects from different programs, which are in the same location, into combined projects that maximise delivery efficiencies.

Figure 4: DoT Asset Management and Planning Document Hierarchy

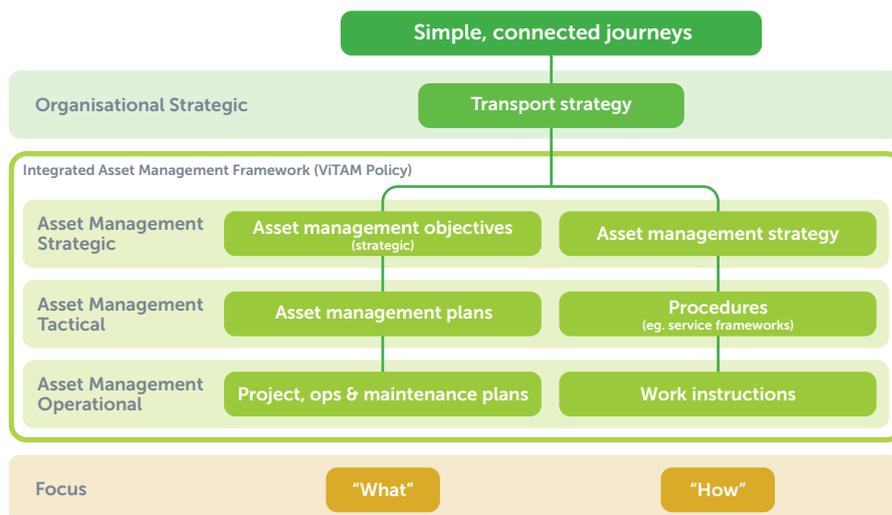
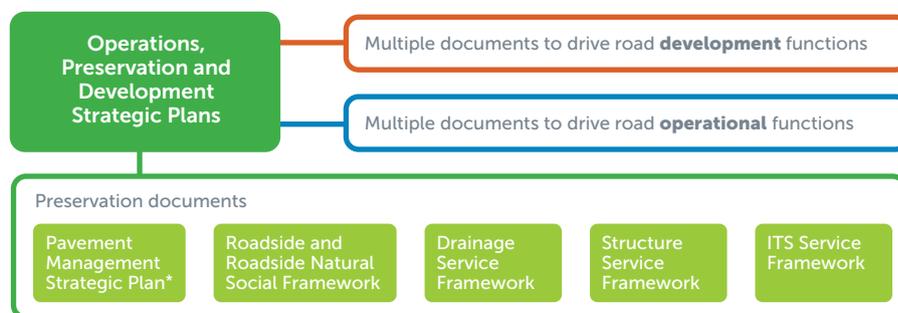


Figure 5: DoT Core Asset Preservation Service Framework



* This document.

3 / Asset Management Principles

Asset Management comprises a number of interrelated functions spanning across the whole of the DoT business.

To assist with explaining how asset management functions relate to DoT statutory obligations, priorities and interventions, DoT is in the process of developing Asset Management Policy that will further articulate asset management principles, as shown in Figure 6.

These asset management principles apply to all assets within the DoT portfolio. These asset management principles have been adopted to guide the Pavement Management Strategic Plan. This strategic plan further articulates how these asset management principles apply to management of the pavement portfolio.

The DoT Asset Management principles have been prepared to align and support wider Victorian Government initiatives.

3.1 Reinforce Road Safety

The wellbeing of the community is a key outcome for the Victorian Government. The Department of Environment, Land, Water and Planning (DELWP) has prepared the Metropolitan Planning Strategy that outlines objectives / principles that impact on wellbeing, including 'Strong communities' and 'Living and working locally'. In recognition of these objectives, the DoT's Strategic Plan has the following key objective, 'Simple, safe, connected journeys'.

Accordingly, DoT commitment to wellbeing specifically targets improving safety of the transport system and minimising the risk of harm. Our asset management processes have been developed in consideration of supporting DoT and Victorian Government objectives.

Our risk management processes include inspections and hazards response frequency as outlined by the RMA and detailed within the RMP. This strategic plan supports positive outcomes by targeting exposure risk (consideration of the highest trafficked roads carried on the highest order RMC roads) in conjunction with the magnitude of the risk (safety first principles) as well as encouraging positive journeys (minimising risk of unplanned maintenance). Where the available funding envelope is insufficient to adequately remove significant risks to road users in a timely manner, DoT manages risk exposure via provision of advisory signage, in accordance with the DoT *Managing Pavements in Poor Condition Policy (June 2015)*.

3.2 Manage Risks for Customer Needs

The road network exists to support customer needs including the commuting needs of the general public, access by emergency services as well as wider economic benefits resulting from the movement of goods across the network. The TIA and the Metropolitan Planning Strategy focus on increasing the competitiveness of

Figure 6: DoT Asset Management Principles



Victorian Industry; improving access to work and education; social and economic participation; and a globally connected and competitive city.

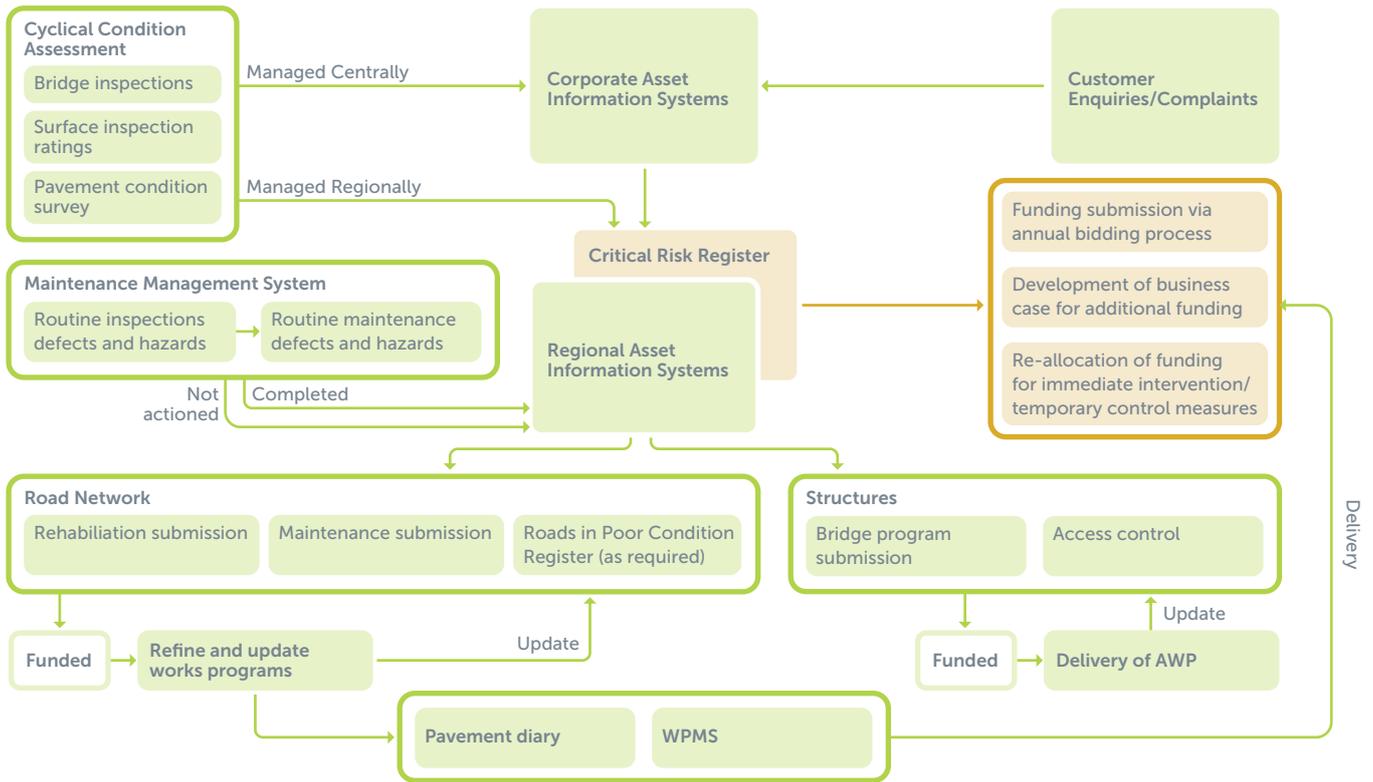
In order to support these objectives, this strategic plan includes consideration of the criticality of risks and the potential impact on the desired network outcomes. The DoT Corporate Plan reflects the wider objectives specifically:

- Provide access to opportunities and support liveable thriving communities
- Promote economic prosperity through efficient and reliable movement of people and goods

A variety of risks exist across the network. Risks exist in the form of asset failures, cost escalations, breaches of LoS obligations, road safety risks, network availability risks etc. To manage these risks, management processes need to be strengthened to better integrate:

- Use of the Roads in Poor Condition Register;
- Maintenance of the Critical Risk Register;

Figure 7: Risk Management Process Overview



- An understanding of the cost escalation implications and associated impact on cost of service delivery;
- Improved data capture and associated data analysis to support evidence-based decision making;
- Improved understanding of asset performance and failure rates; and
- Setting of targets for technical service levels.

Identified risks have traditionally been managed by prioritising on an urgency basis whilst being aware of levels of service requirements, funding constraints and network demands.

The risk associated with unfunded defect repairs has been managed via temporary control measures including speed reductions and the installation of warning signs. The extent to which road users are exposed to such risks across the network will be minimised in accordance with safety first principles, within the available funding envelope.

The current process of Risk Management and Control is presented in summary form in Figure 7. Critical

risks identified will be placed on a Critical Risk Register that will be considered during the development of optimised works programs.

3.3 Community Resilience

Infrastructure Resilience can be defined as the ability to survive an event in the face of complex, uncertain and changing circumstances; it is a way of thinking about both short-term cycles and long-term trends. It includes the ability to reduce the magnitude and/or duration of disruptive events and deliver target levels of service. DoT aims to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event.

Our experience informs us:

- 1 There are increasingly uncertain climatic factors and stretched infrastructure budgets.
- 2 Historically, timely maintenance and renewal programs are preferable to one-off major reconstruction programs.
- 3 The task of connecting people with goods and services is growing, and an 'off-season' doesn't exist.

- 4 Works completed at night and/or during road closures may minimise community impact.

Our stakeholders require the network to provide connectivity and access as a core requirement. Continuity of service is essential. Network resilience includes the ability of an asset to 'resist' an event and the asset management system's ability to 'restore' service after an interruption.

Our network is subjected to a number of environmental impacts as well as changing demand. DoT has adopted a long-term design approach to the creation of physical infrastructure. Notwithstanding the typically long useful lives of road infrastructure assets, some assets will be adversely impacted by the environment from time to time as follows:

- Localised flooding exceeding design standards
- Bushfires that exceed the scope of the bushfire management strategy
- Land use planning changing in advance of infrastructure planning to meet growing demand

Whilst our assets have some inbuilt 'resistance' to the environment, it is not feasible to build all infrastructure to withstand all environmental events. Accordingly, the 'resistance' of infrastructure needs to be relevant to the criticality of the asset, including potential service interruption disruption.

In some situations, the response to service disruptions may warrant a lower design standard as an interim measure to restore services, followed by more substantial disaster recovery works at a later date.

DoT response to network resilience issues may include:

- Applying knowledge and technology in:
 - i. Asset management
 - Strengthening asset management processes
 - Quantitative, risk-based analysis
 - ii. Pavement and materials
 - Learning from past performance
 - Leveraging technical experience to inform resilient treatment selection
 - iii. Network planning and access management
 - Route and corridor risk assessments
- Funding
 - Alternative funding scenarios
 - Provision of funding for 'betterment' of assets to mitigate against natural disaster events or changes in land use planning
- Delivery
 - Procurement models with works delivery partners to enhance restoration ability

3.4 Demand Management

DoT recognises that the environment that our customers use, the road network, has changed over time. Over the past couple of decades, a significant increase in vehicle traffic, particularly commercial traffic has been recorded. This reflects a long period of economic growth experienced in Australia. This growth has been experienced within the metropolitan areas of Victoria as well

as parts of our rural network, such as in the South Western region.

Victoria's population is growing at more than 2% annually (2018-2019), and the number of additional vehicles registered is growing significantly every week. The impact of commercial vehicles must also be considered in the context of changes to permissible vehicle mass limits.

DoT commitment to productivity improvements is stated in the DoT Corporate Plan, which aligns to State and Federal objectives including Infrastructure Australia's strategy to expand Australia's productive capacity whilst improving Australia productivity.

Previous road maintenance and renewal investment models (supported by Federal funding for National highways) resulted in a consistent distribution of funding, across the state-wide arterial network, regardless of road function. This funding distribution model is no longer sustainable in an investment constrained environment. Our stakeholders, including customers and government, require a more cost-effective approach to maintenance and renewal investment and the ability to measure and report outcomes.

The Pavement Management Strategic Plan has been developed to support these objectives, where an increasing emphasis has been placed on strategically important roads that carry the highest traffic volumes and carry the highest commercial vehicle volumes. This focus is central to the increased use of Road Maintenance Categories to inform renewal investment decisions.

3.5 Statutory Obligations

The objects and functions of DoT are explained in Part 3, Division 2 of the TIA. Under s 32 of the Act, the primary objective of DoT is to give effect to the vision statement, the transport system objectives and the decision-making principles. It is also responsible for reviewing the strategic, corporate and business plans and budgets of public sector transport agencies, VicTrack and transport agencies to ensure that they are consistent with the vision statement, the transport system objectives and the decision making principles of the TIA.

The Secretary of DoT, Paul Younis, is also the Head, Transport for Victoria (TfV). Transport-related functions and powers have been allocated between the Secretary of DoT and the Head, TfV. The Head, TfV is responsible for much of Victoria's road and road-related infrastructure and is the state road authority and the coordinating and responsible road authority in place of VicRoads. The Head of TfV is subject to the requirements of the RMA. The purpose of the RMA is to establish a coordinated management system for public roads that will promote safe and efficient state and local public road networks and the responsible use of our roads.

Our commitment addressing statutory obligations is inclusive of wellbeing of our workforce and the public in addition to environmental initiatives. Innovation is a constant in the way we approach workplace health and safety as well as environmental management.

3.6 Provision of Service Levels

Identifying the performance metrics to deliver the required network outcomes is a fundamental activity. The inter-relationship between technical service levels, customer service levels, intervention criteria and standards is described in Section 5.5.

Service Levels are considered relative to the investment levels assessed and associated risk profile. DoT monitor, evaluate and report service level performance as part of core business functions.

3.7 Financial Sustainability

Prudent financial management is a fundamental requirement of DoT across the broad range of its operations. This is particularly important in long term investment decisions related to an asset portfolio worth \$54.6 billion, including \$31.8 billion of pavement assets plus an additional \$9.2 billion for earthworks (as at 30 June 2020).

Central to this is the ability to adequately balance:

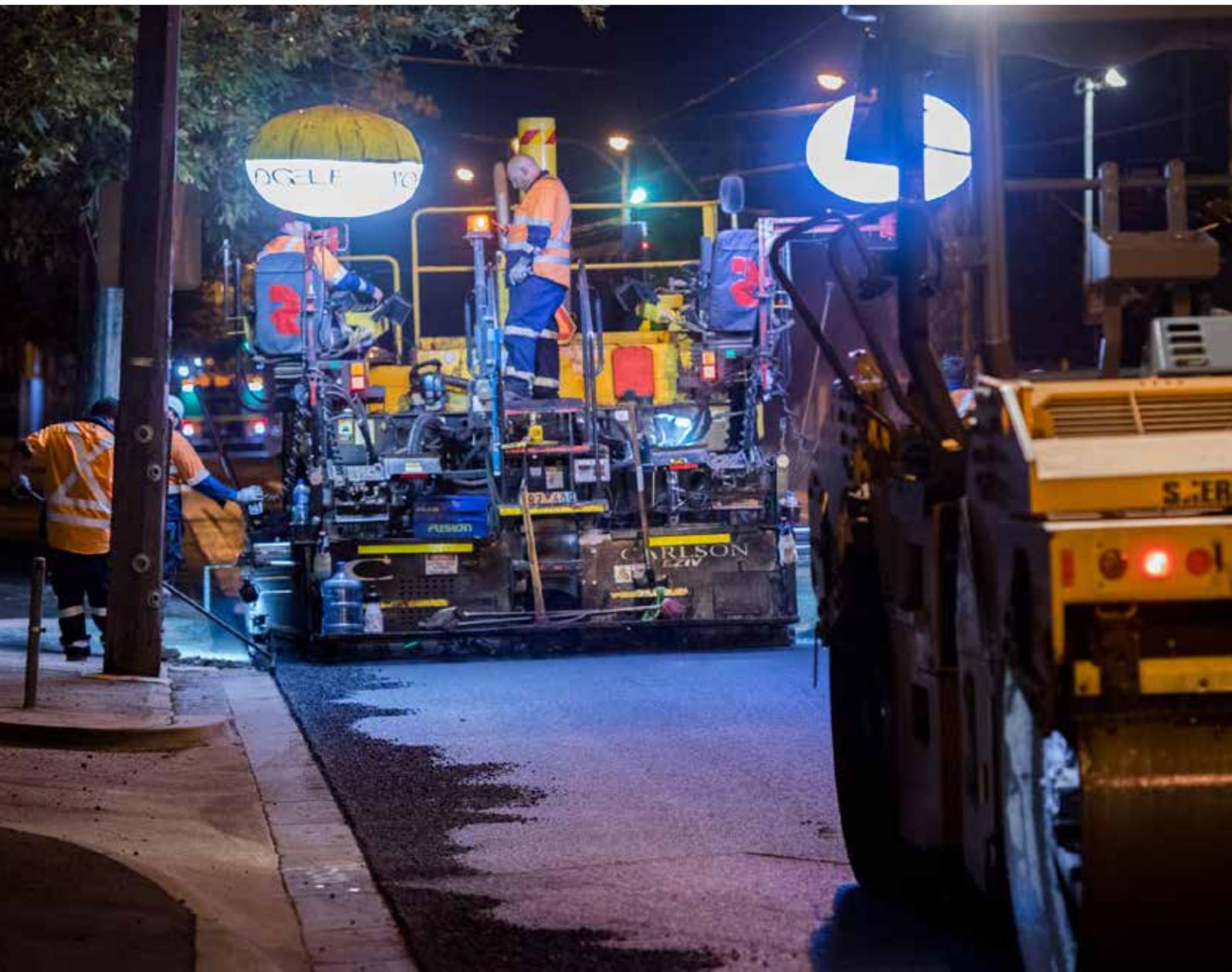
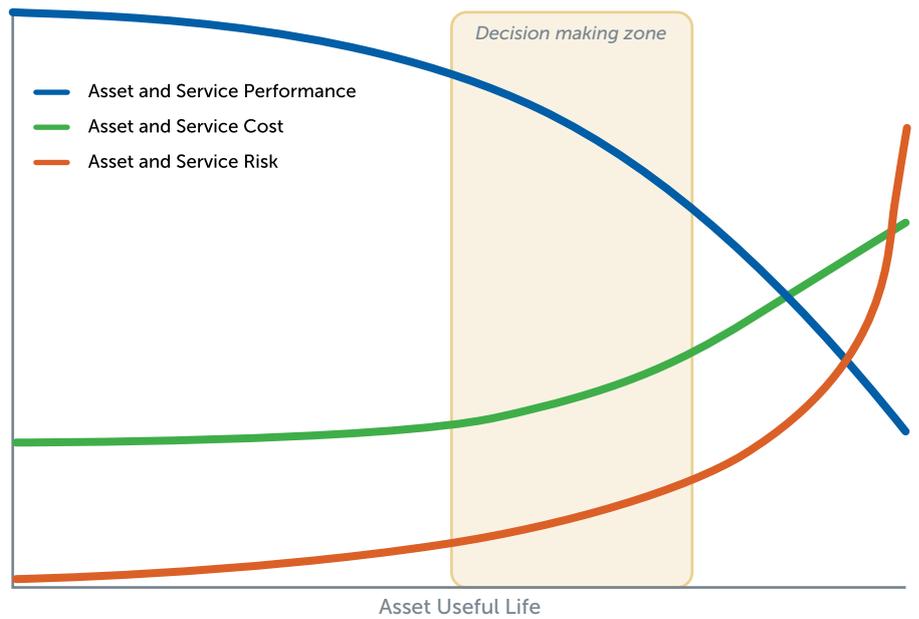
- Service level
- Risk
- Cost

Understanding current and long-term maintenance and renewal needs, relative to the performance and risk implications, is a key outcome of this Pavement Management Strategic Plan.

DoT has invested in data and data management systems to support effective decision making. Data that is timely, consistent and of a known information quality level is being used within a Pavement Management System (PMS) to:

- Determine maintenance and renewal requirements for pavement and surfacing assets across the Victorian arterial network
- Develop candidate four year works programs, inclusive of prioritisation considerations
- Evaluate modelling scenarios to inform investment options

Figure 8: Balancing of Service, Cost and Risk



4 / Core Business Activities

The purpose of assets is to enable the provision of services to the community.

DoT is tasked with managing infrastructure assets to provide community services. The effective delivery of community services, through management of a portfolio of assets, requires integrated planning processes. Pavement and surfacing assets are high value and asset failure presents high risk to service provision. As such, DoT adopts sophisticated pavement management practices to achieve best value.

The adoption of sophisticated management practices enables increased benefits to be realised. This strategic plan enables the realisation of Victorian transport objectives presented in Section 2.1, including moving more freight, more efficiently whilst delivering predictable journeys for our customers.

DoT plans for various investment scenarios, such that the associated risk and service level outcomes are relayed to government to enable evidence-based decision making. Each year the Victorian government assesses submissions received from DoT and makes budget allocation decisions. DoT then manages their portfolio of assets to minimise whole of life costs, within the constraints of available budget.

DoT delivers a number of core pavement management business activities. Table 1 illustrates the alignment between the whole of portfolio asset management principles, as detailed in Section 3,

and more specific pavement management business activities which DoT uses to guide planning, investment decisions and asset management processes.

4.1 Core Business Activity

Adopt service focussed outcomes that support road safety, value creation, political and environmental objectives.

DoT is required to support the delivery of Victorian Government objectives. These objectives are broad ranging and the levels of service reflect the commitment DoT is making to Government and DoT organisational objectives. This mature approach to asset management planning enables DoT to proactively provide evidence-based information in support of investment requirements required to deliver agreed service levels.

DoT understands that to achieve service focussed outcomes, planning around service levels is required. As such, this Pavement Management Strategic Plan describes how DoT:

- Aligns Government and DoT objectives to Asset Management principles.
- Monitors, evaluates, and reports technical service levels, to quantify network outcomes.
- Assesses risk outcomes and investment needs to achieve service level options.

Figure 9 is a schematic, that demonstrates organisational objectives and service level considerations inform the assets

required delivering services and ultimately, the budget required to achieve the desired service levels.

Figure 9: DoT Asset Management Planning Approach

Organisation Management



4.2 Core Business Activity

Collect data to inform evidence-based decisions regarding investment options.

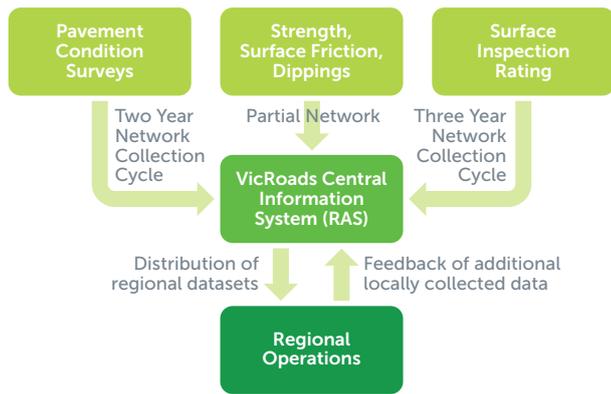
Effective asset management planning relies upon current, accurate and consistently collected data. DoT has invested in annual surface condition assessments across the arterial road network for more than two decades. These network wide condition assessments collect critical data, to inform evidence-based decision making, as follows:

- Roughness
- Rutting
- Surface cracking
- Texture
- Loss of aggregate

Table 1: Alignment of Core Business Activities to Asset Management Principles

Pavement Management Core Business Activities	DoT Asset Management Principles						
	Manage the asset to reinforce road safety	Manage the risks to ensure roads support customer needs	Increase Community resilience to natural disasters and other system disruptions	Manage the road assets to support future land use change in transport needs	Meet statutory obligations	Sustainably manage assets to minimise whole of life costs	Deliver level of service, at the lowest long-term cost to the community
1 Adopt service focussed outcomes that support road safety, value creation, political and environmental objectives	✓	✓		✓	✓	✓	✓
2 Collect data to inform evidence-based decisions regarding investment options	✓	✓		✓		✓	✓
3 Adopt predictive modelling techniques to assess network wide costs and benefits for different investment scenarios			✓			✓	
4 Prepare business cases for funding consideration that reflect the risk and LoS outcomes for pre-defined investment scenarios	✓	✓	✓		✓	✓	✓
5 Apply risk management and balance with levels of service, for optimal outcomes, within the constraints of the available budget	✓	✓			✓	✓	✓
6 Allocate activity-based funding to regions at a program level			✓	✓		✓	
7 Leverage local expertise within regions for project level decision making, to empower accountable decision making and increase program efficiency	✓	✓					✓
8 Monitor performance to measure effectiveness of investment decisions, including output, service, access and financial performance metrics	✓	✓	✓		✓	✓	✓
9 Deliver an annual works program that supports the pavement's program objectives and expected outcomes	✓	✓	✓			✓	✓
10 Manage delivery of works programs to achieve state-wide performance targets			✓	✓	✓		✓
11 Adopt a learning culture to continually improve and evolve our planning processes				✓			✓

Figure 10: Co-ordinated Data Collection Program



- Maintenance Patching
- Deformation
- Binder condition
- Skid resistance (partial network)
- Deflection (project level only)

These parameters are collected and reported across a two or three-year cycle. All data collected is managed centrally and subjected to validation protocols to ensure that the data is fit for purpose to support decision making processes. Figure 10 illustrates the DoT pavement data collection program.

4.3 Core Business Activity

Adopt predictive modelling techniques to assess network wide costs and benefits for different investment scenarios.

DoT uses a Pavement Management System (PMS) to enhance management of the pavement asset. The PMS incorporates inventory data, deterioration models, road usage data, functional classification of road sections, climate and terrain data, treatment options, costing data and intervention levels linked to technical service levels.

The PMS predicts the condition of the network into the future, based on investment and treatment intervention options. This enables DoT to determine and demonstrate the levels of service that result from different investment options. The PMS demonstrates the quantity of service gap and provides knowledge of the quantity of projects that meet the treatment criteria each year.

The PMS enables DoT to conduct:

- **Complex modelling** – Conduct detailed analyses of cost and service level trade-offs for different scenarios.
- **Strategic analysis** – Determine the future condition of the road network and analyse the predicted performance consequences of different investment options and management approaches.
- **Tactical analysis** – generate candidate project lists for work programs across a selected road network.

4.3.1 Deterioration Models

DoT has adopted Austroads deterioration models as the primary models to predict future network performance. These Austroads deterioration models are based on more than a decade of empirical data collected and analysed as part of the Austroads Long Term Pavement Performance project. In addition to the Austroads deterioration models, PMS is capable of accommodating further models such as probabilistic models and remaining structural life. The implementation allows a degree of flexibility for the user to calibrate and adjust the models. The adoption of this approach allows DoT to realise the benefits associated with tried and tested modelling criteria, to inform evidence-based cost, risk and service level trade-off analyses.

The key deterioration models implemented include:

- cracking progression model
- rut depth progression model
- roughness progression model

- loss of aggregate
- maintenance patching
- texture

4.3.2 Intervention Levels

Intervention levels are set to trigger treatment options within PMS analyses. For any given treatment option, different intervention levels are set depending on the functional classification of the road section. This functional classification aligns with the Road Maintenance Categories, as is described in further detail in Section 5.5.3.

4.3.3 Treatment Selection

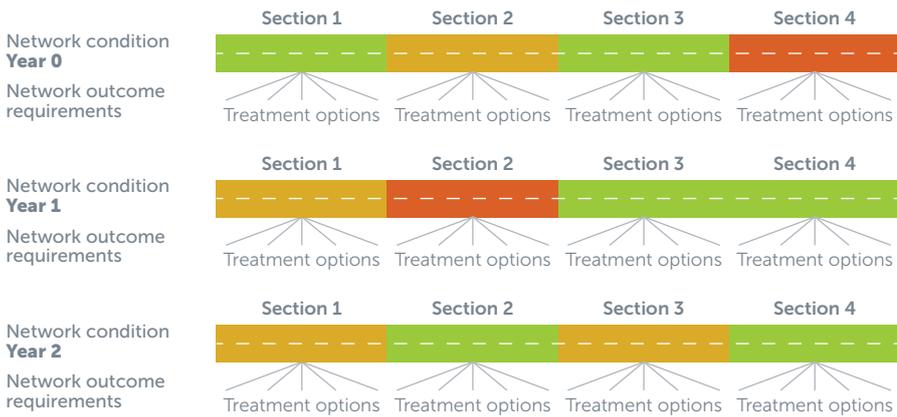
A range of typical renewal treatment types, that are appropriate for application across the Victorian arterial road network, are built into the PMS. As the cost of treatments can vary in different geographic regions, and also for different treatment types, unit rate costs are used for each combination of DoT Region and treatment option.

The PMS enables evaluation of the condition of a pavement section against the intervention (trigger) criteria and generates a treatment option when the criteria are met. The treatments generated on a single road section over the analysis period are considered a strategy. Several strategies can be generated for a given road section, depending on the way the triggers are defined, as illustrated in Figure 11.

4.3.4 Optimisation

The PMS tool enables optimisation of conditions, road user costs, safety (in the future), maintenance costs or to the specific intervention triggers. The software has built in functionality to enable analysis of the minimum network preservation cost (i.e. minimum budget required) as well as optimisation functionality to analyse a critical path of optimised treatments throughout the analysis period, and across budget categories or sub-networks. The user can customise their optimisation models. Similarly, the user can choose which parameter/parameters are the most important for the optimisation (e.g. the desire to achieve the lowest network level roughness, rutting, cracking or a combination of these). The existing objective function,

Figure 11: Schematic of treatment selection options by PMS road section



used to optimise the PMS analyses, is an overall pavement condition index. Future objective functions are expected to include road user costs and safety variables.

For each investment scenario analysed, the PMS selects a strategy for each road section in such a manner that it meets (or at least approaches as close as possible) the optimisation target for each segment of road for each year of the analysis. When a constrained budget is modelled, the selected strategies must meet a dual target, namely (1) achieving the best overall condition (2) not exceeding the available funding envelope.

PMS optimisation is achieved by executing pre-defined scenarios. Additional scenarios may be modelled to allow more detailed analysis of the benefits that can be realised. The outcomes of the state-wide investment scenario modelling are used to inform key DoT planning documents and processes as follows:

- Road Asset Management Plan (not developed at the time of writing this strategic plan)
- Business Cases (e.g. DoT 2017/2018 *Better Roads for More Communities*)
- Determining program level allocations and technical service level targets.

Where Transport Services also choose to conduct PMS modelling, for specific regional networks, the outcomes are typically used to inform effective and efficient development of renewal programs within the constraints of the program level allocations advised by

Transport Assets. This modelling will supplement the candidate treatment sites provided by Transport Assets, to better inform project level decision making.

4.4 Core Business Activity

Prepare business cases for funding consideration that reflect the risk and LoS outcomes for pre-defined investment scenarios.

Long term asset management planning requires the consideration of risks at the same time as understanding how levels of service are impacted by investment levels. DoT recognises that assets deteriorate over time; assets need to be managed and maintained to deliver the required levels of service; and assets require funding to operate and be renewed to provide reliability of service.

In 2017 DoT prepared a multi-year Business Case, *Better Roads for More Communities*, which outlines network outcomes resulting from a range of investment scenarios. This Business Case will be periodically updated as required, as part of the DoT annual business planning cycle, and submitted to the Victorian government to assist with informing investment needs for the Victorian pavement asset portfolio.

A consistent approach to the investment scenarios is required over time. As detailed in Section 5.3, the three DoT pre-defined scenarios to be considered as a minimum are:

- Current Investment
- Holding Condition Investment
- Sustainable Investment

Business cases will be prepared that are consistent in the presentation of LoS opportunities relative to investment levels and associated risks. DoT business cases will have a 10-year outlook and outline investment opportunities for a four-year period. This transparency will increase confidence in DoT operations from planning through to delivery.

4.5 Core Business Activity

Apply risk management and balance with levels of service, for optimal outcomes, within the constraints of the available budget.

DoT uses predictive analytics to forecast future asset and service performance. Forecasts include an understanding of service performance, cost escalations and asset risk profiles. The investment scenarios modelled within the PMS inform the DoT Road Asset Management Plan (to be developed) and DoT Pavement Business Cases. This documentation shall demonstrate the trade-off between costs, risk and service level for each scenario. As part of the annual business planning cycle, these key DoT planning documents will be made available to assist the Victorian government with making informed decisions regarding investment needs of the Victorian arterial pavement network.

Annually, a budget allocation is provided to DoT for the maintenance and renewal of pavement assets. The budget provided will not necessarily resemble the funding profile identified in one of the scenarios analysed during the annual business planning cycle. Accordingly, DoT conducts further analyses to ensure more granular budget allocations and performance metric targets are provided to Transport Services, to drive optimal outcomes within the available state-wide funding envelope.

4.6 Core Business Activity

Allocate activity-based funding to regions at program level.

Asset Management fulfil a vital role in the coordination of the pavement maintenance and renewal investment planning. Asset Management has developed a multi-year business case

that outlines funding requirements pertinent to the investment scenarios presented. This 10-year business case is subject to revision and update to reflect network changes and delivery outcomes.

A draft four year program is extracted from the 10-year plan, which Asset Management utilises to create an initial list of candidate treatment sites. Funding levels for pavement maintenance and renewal investment across the state and between the regions is the result of extensive analysis of available datasets to optimise performance metrics aligned to the Asset Management Objectives.

Asset Management allocates pavement maintenance and renewal funds to each of the seven Regions, typically at a program level. Asset Management also provides the list of candidate treatment sites to Transport Services, to assist regions with efficient project level decision making aligned to state-wide technical service level targets. Although program level allocations to Regions are the norm for DoT, project level allocation may be required at times to ensure political commitments are monitored for reporting purposes. Figure 12 illustrates how central network planning by Asset Management integrates with Regional activities, such that delivery of programs is aligned to strategic network planning.

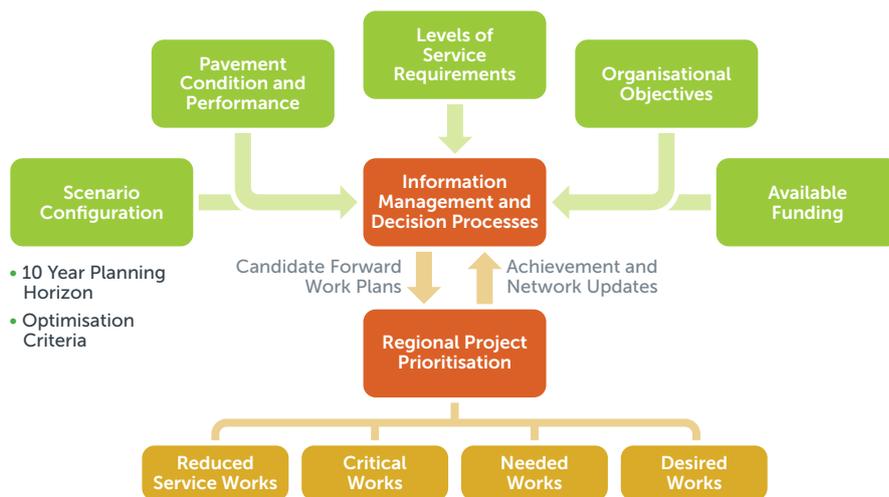
4.7 Core Business Activity

Leverage local expertise within regions for project level decision making, to empower accountable decision making and increase program efficiency.

Partnership between Asset Management and the seven Regions is critical to ensure the program delivers the required outcomes. Collaboration with the regions enables:

- Local and dynamic pavement asset needs to be considered, that may not have been identified from the network wide analysis;
- Consideration of enhanced local datasets, such as escalating routine maintenance costs, where any efficiency savings can be immediately reinvested;

Figure 12: Overview of Network Investment Planning Cycle



- Co-ordination and packaging of regionally managed projects, such as drainage and line marking, to realise efficiency opportunities;
- Co-ordination with minor upgrade programs or other network improvements (e.g. road safety programs) that are delivered by the regions; and
- Consideration of imminent or future network demand changes, which would increase service delivery risk on a criticality basis.

DoT has seven regions consisting of two metropolitan and five rural regions. Each Region is required to develop maintenance and renewal programs, at the project level. A core input to the pavement and surfacing renewal programs is the candidate list of project sites, generated from the state-wide PMS modelling. Regions may also choose to conduct their own PMS modelling to supplement the candidate treatment sites provided by Transport Assets. As part of refining and updating the four year works programs, Regions are required to provide feedback to Asset Management regarding the state-wide PMS candidate list. This enables Asset Management to learn from Regional experience and modify state-wide PMS parameters and variables overtime, to ensure more effective modelling outputs.

The Regions are encouraged to complement Asset Management program level decision making via the adoption of robust project level decision supporting tools. Wherever practicable, these regional tools should be configured to align with the

organisational metrics such as:

- Pavement materials;
- Deterioration profiles;
- Intervention levels used for state-wide modelling;
- Maintenance industry capability and work effects achievable;
- Maintenance costs, and
- Environment.

4.8 Core Business Activity

Monitor performance to measure effectiveness of investment decisions, including output, service, access, and financial performance metrics.

Monitoring, evaluation and the transparent reporting of a range of metrics is critical to the evaluation of the effectiveness of investment decisions. Within this strategic plan, DoT has set a number of technical performance measures as per the following categories:

- Output;
- Service;
- Access; and
- Financial.

These performance measures are detailed in Section 5.5.2. The reporting mechanism will vary depending on the measure. An annual network report will be provided to the DoT Executive, to ensure top management is aware of network performance being achieved.

4.9 Core Business Activity

Deliver an annual works program that supports the pavement program objectives and expected outcomes.

DoT employs a number of maintenance delivery mechanisms to deliver the physical works across the state. These mechanisms include:

- Service Level Agreements
- Alliance Agreements
- Individual program and project contracts

Maintenance and renewal projects are delivered by Transport Services. The individual projects are selected in line with the program objectives. Achievement reporting is required to characterise the outcomes of the physical works to evaluate the effectiveness of the annual works program against the expected outcomes.

Network condition is dynamic and Transport Services play a key role in information management and maintaining the currency of the network attributes. Timing and accurate feedback loops are an essential element of delivery of the annual works program.

4.10 Core Business Activity

Manage delivery of works programs to achieve state-wide performance targets.

To ensure alignment across DoT business areas, the performance measures within this strategic plan will be developed as a collaborative effort from Asset Management and Transport Services. This will include the setting of Region specific targets to inform the development of the four year works programs. These Regional performance measure targets will provide guidance to Transport Services regarding post-delivery expectations, to achieve the state-wide performance measure targets.

DoT regional delivery models will be configured to maximise the realisation of efficiency opportunities. By cascading the state-wide performance targets to the Transport Services, greater clarity for the Transport Services is provided. In this

environment, Transport Services are better positioned to manage delivery of the annual works programs by bundling / packaging projects from different programs, such as drainage or line marking projects. Additionally, Transport Services can commence early preparation works for future annual programs. For example, shoulder reinstatement, drainage reinstatement, vegetation clearing, culvert clearing, etc. can all be undertaken in preparation for future pavement works programs.

4.11 Core Business Activity

Adopt a learning culture to continually improve and evolve our planning processes.

DoT embraces continuous improvement as an integral aspect of all this activity. Continuous improvement of processes, personnel and technology is a primary way to ensure the asset portfolio enables delivery of community services safely, effectively and efficiently.

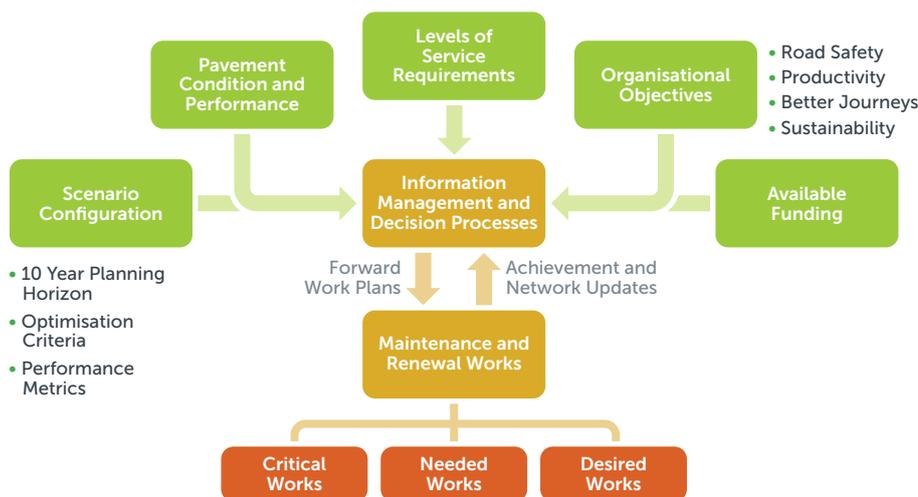
The DoT Service Framework (under development at the time of writing this strategic plan) provides overarching guidance regarding whole of organisation continuous improvement priorities.

5 / Investment Decision Making Principles

DoT adopts a range of processes to balance cost, risk and service levels.

This section provides an overview of the key considerations used to make informed investment decisions for pavement maintenance and renewal programs. Figure 13 outlines key criteria which inform our investment decision making criteria.

Figure 13: Decision making model overview



5.1 Investment Drivers

The DoT Pavement Management Strategic Plan focuses on maintenance and renewal programs for surfacing and pavement assets, for which core drivers of investment include:

- Safety
- Economic Benefits
- Functionality
- Network Preservation
- Whole of Life Costing
- Capacity
- Quality
- Responsiveness

5.2 Planning Horizons

The Victorian arterial road network has been developed over more than a century. The network needs, to meet required levels of service, are not homogeneous. As such, the asset investment needs will vary in a non-linear manner across the state.

Assets deteriorate over time as a result of network use and environmental factors. The impacts of the environmental factors are relatively well understood, but climate impacts are somewhat unpredictable.

Road pavements are long life assets, provided that appropriate asset preservation activities are undertaken in a timely manner. The pavement

structure can have a useful life of decades, whilst pavement surfacing typically has a useful life of 10 to 15 years.

The expected useful life of a pavement and pavement surfacing assets is impacted by our customers using the road network. The actual useful life of a pavement or pavement surfacing varies on a road by road basis, depending on the type and quality of construction, traffic, drainage, and environmental factors. Asset consumption is greatest from commercial vehicles, with the impact of a single commercial vehicle being equivalent to approximately 2,000 to 10,000 passenger vehicles.

Figure 14: 10 Year Investment Horizon



DoT has adopted a minimum 10-year investment horizon for strategic decision making. This will provide sufficient confidence that annual variations in performance, cost and risk can be considered appropriately whilst noting the uncertainty related to future network demand and environmental changes. DoT uses these strategic modelling outputs to develop a more detailed four year

forward program. This four year forward program is then developed into an annual delivery plan.

5.3 Scenarios

Investment decision making requires a balancing of cost, risk and performance (expressed in terms of LoS). That is, different levels of investment will produce different risk profiles and service outcomes. Vice versa, setting differing service targets will require differing levels of investment needs. Scenario modelling enables the evaluation of alternative options for network level investment.

Historically, the management of pavement assets in DoT have been maintenance centric which meant that funding drives treatment outcomes and hence the development of funding driven scenarios models. To improve the maturity on investment scenarios, technical levels of service such as intervention triggers for various pavement condition parameters have been introduced. Moving forward, it is important to adopt objective drivers with service-based decision metrics which informs the funding needs. Accordingly, DoT will achieve service driven scenario models.

Figure 15 shows the interplay between service scenarios compared with funding driven scenarios. Note, that differing funding levels correspond to service outcomes and vice versa. Therefore, it is important to understand the required funding to achieve service targets, which in

turn support service driven planning. Without understanding service targets, DoT would not be able to recognise what the current funding is providing.

The boundaries for funding driven scenarios are zero renewal funding and unlimited renewal and routine funding. The boundaries for service driven scenarios should be based on the target LoS, which can be based on a range of multiple service targets (e.g. minimum required and desired targets).

The following minimum scenarios are required to be modelled for the pavement asset at a network level, with the caveat that service targets are understood. As of the development of the PSF, LoS is in development as part of the Customer LoS project. Pavement condition parameters and intervention triggers are used to represent and set the technical service target. Network expansion and improvement projects (capital investment) are not considered in any pavement scenario modelling.

1. Zero renewal funding (only routine maintenance funding):

This scenario acts as the lowest boundary constraint. This scenario is used to calibrate the model to test the model configuration. Minimum routine maintenance activities are required in order to prevent premature asset failure / allow asset service lives to be achieved.

2. Holding current/existing renewal funding:

Assumes the recent (i.e. past three years) level of renewal and routine maintenance funding is maintained

over the 10-year planning horizon, with a nominal CPI increase each year. This investment considers any efficiency targets that may be in place from central government. This investment level is unlikely to realise additional benefits related to road safety and predictable journeys for our customers.

3. Unlimited renewal funding:

This scenario acts as the highest boundary constraint. This scenario is used to calibrate the model to test the model configuration.

4. Holding current service scenario:

Assesses the level of renewal funding required to hold the network condition at the current LoS. This option will typically hold the residual renewal liability in year 0 at a similar level in year 10. Liability is expressed in terms of financial commitment required to address service breaches (as opposed to length of network outside of service standard). As the network is in a state of decline, this investment level is likely to realise minimal additional benefits related to road safety and predictable journeys for our customers.

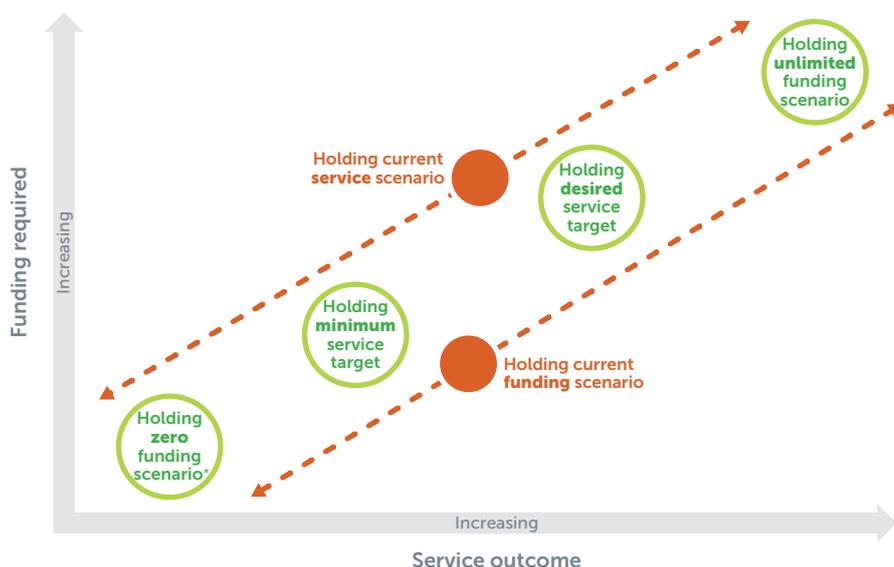
5. Moving to desired service target scenario:

Assesses the level of renewal funding required to progressively move towards and sustain the network condition at the desired service level. The desired service can be higher or lower when compared to the current service delivered through current funding. The service target can be either a single target or a range of targets from minimum to desired. Pavement condition parameters and index are used as the service target measure, where the current desired service target is modelled as zero maintenance and renewal liability in year 10. This investment level provides the opportunity for Victorian Government objectives such as efficiency, road safety and journey benefits to be maximised.

Additional scenarios can be modelled in between the sliding scales of both funding and service levels as well as the consideration alternative maintenance funding arrangement.

Furthermore, at a state-wide or regional level, to allow more detailed analysis of the benefits that can be realised. The investment level required for each of these scenarios,

Figure 15: Scenario Types



along with the associated risk and LoS outcomes, are used to inform business cases and annual planning processes. The Victorian Government uses this information to make informed decisions regarding the annual budget for pavement and surfacing programs. DoT then allocates funding to program delivery, in a manner that maximises efficiency and limits risk.

For example, a whole of corridor service scenario could be modelled. This scenario would include additional costs associated with adjacent shoulder and roadside drainage maintenance costs that would support enhanced customer levels of service.

Similarly, a scenario that removes budget silo constraints could be considered to enhance the understanding of the interplay between preventative (periodic) maintenance and rehabilitation.

DoT will maintain a log of all changes to inputs, models, objectives including the outcomes resulting from the changes.

5.4 Road Maintenance Categories

DoT manages the roads for which it has responsibility under the RMA in accordance with the DoT RMP.

The RMP references an RMC for each road section that DoT is responsible for. The nominated RMC for each road section has been determined according to an assessment of risk, taking into account factors such as road classification, road type, and traffic volume and traffic type.

Road Maintenance Categories also use key factors such as route connectivity and access, traffic volumes, number of commercial vehicles/principal freight network, tourist priority route and public transport to establish relative functional classification levels.

DoT uses Road Maintenance Categories presented in Table 2 to assist with prioritisation of maintenance and renewal investment on the road network.

Table 2: Road Maintenance Categories and definitions

RMC Score	RMC Definition
1	Those roads, which form the principal avenues for communications between major regions, including direction connections between capital cities
2	Those roads, not being Class 1, whose main function is to form the principal avenue of communication for movements between: <ul style="list-style-type: none"> • a capital city and adjoining states and their capital cities; or • a capital city and key towns; or • key towns.
3	Those roads, not being Class 1 or 2, whose main function is to form an avenue of communication for movements: <ul style="list-style-type: none"> • between important centres and the Class 1 and Class 2 roads and/or key towns; or • between important centres; or • of an arterial nature within a town in a rural area.
4	Those roads, not being Class 1, 2 or 3, whose main function is to provide access to abutting property (including property within a town in a rural area).
5	Those roads, which provide almost exclusively for one activity or function, which cannot be assigned to Classes 1 to 4

5.5 Levels of Service

Assets exist primarily to support the delivery of services to customers. Road users have expectations that the network supports safe and comfortable journeys for people and goods. Our customers intuitively understand the need for different levels of service that reflect the different road categories and how the roads are used.

The arterial network is vital infrastructure that supports Victorian Government objectives. Our approach to maintenance and renewal planning incorporates consideration of needs of customers and Government priorities, including:

- Economic development across the region via consideration of freight/business outcomes;
- Multimodal transport outcomes by considering public transport;
- Supporting tourism outcomes including tourism operators and visitors to the region;
- Protection and consideration of vulnerable road users including pedestrians and motorcyclists; and
- Enhanced road safety outcomes that reduce road trauma.

Establishing maintenance and renewal standards requires an understanding of customer expectations, government priorities, the effectiveness of maintenance interventions and the performance characteristics of the asset portfolio. Our commitment to customer levels of service will be supported by measurable technical service standards and intervention criteria across the Road Maintenance Categories. The technical service standards documented within the Pavement Management Strategic Plan cover the following metric categories:

- Output measures
- Service measures
- Access measures and
- Financial measures.

The vertical transparency between the customer levels of service and the technical service standards will drive our program development tasks and will support our annual monitoring, evaluation and reporting tasks. DoT is committed to continuous improvement, including a focus on development of an integrated performance monitoring regime. The DoT performance monitoring regime will be further developed over the next two years, to define and agree service levels and performance metric targets.

5.5.1 Customer Service Levels

There are a broad range of stakeholders who have a vested interest in the way in which the Victorian Road Network operates. Stakeholders include:

- General public including commuters
- Government Agencies

- Public transport operators
- Freight industry including transport companies and owner operators
- Tourism businesses
- Maintenance contractors
- Local and regional advocacy groups (e.g. RACV, Bicycle Victoria, etc.)
- Emergency services (Police, SES, CFA, etc.)
- Road safety professionals
- Cyclists
- Motorcyclists

The perspective of the stakeholders varies but common expectations include the following:

- A safe environment free from hazards;
- Access within and between communities;
- Coordinated and integrated maintenance;
- Proactive and effective communications resulting in minimal unplanned disruption; and
- Provision of resilient roads that maintain access for communities and emergency services in all weather and environmental conditions.

DoT does not currently have a set of defined Customer Service Levels; however it is currently being prepared.

Research is conducted that provides an insight into customer expectations and levels of satisfaction. Independent research of our customers indicates that:

- 80% of the Victorian population has shown overall satisfaction with road network
- 71% of the Victorian population has shown satisfaction with road usage experience
- Almost 90% of the Victorian population consider freeways and arterials in daily commuting
- Sealed road surfaces and condition of shoulders were the top two maintenance priorities for all Victorian geographic location groups

Further detail is available within the Customer Needs Survey however there is general alignment in the customer responses regardless of respondent location.

5.5.2 Technical Service Levels

DoT is moving towards utilising a balanced set of performance metrics within the following categories:

- Output measures
- Service measures
- Access measures and
- Financial measures.

The performance metrics used to describe the Technical Service Levels will be used for a range of different business purposes, including:

- Informing Renewal Investment Decisions
- Organisational Reporting to the DoT Executive
- Whole of Government Assurance Reporting

The range of performance metrics available can be used to monitor, evaluate and report performance of the pavement portfolio. The number of performance metrics used will vary, depending on the business purpose, as is outlined in Figure 16.

Technical service levels can also be described as performance measures. Any performance measure is made up of both a 'description' of how the metric will be measured and

a 'target' providing a goal to drive investment decision making. This Pavement Management Strategic Plan documents the suite of performance measures that will be monitored by DoT going forward; however, it does not detail the targets to be adopted. Targets will be set in the future, as part of this new performance monitoring regime, as DoT beds down monitoring processes and better understands the investment required to achieve specified outcomes.

The setup of this new performance monitoring regime will be overseen by the Pavement Management Steering Committee and will initially include an evaluation of historical performance where practicable, ideally looking back four years. These historical performance trends will provide empirical evidence to inform the setting of achievable targets.

DoT will monitor and evaluate the performance metrics in Tables 3 to 6. DoT will report annually to the DoT Executive regarding the network performance achieved in the preceding year. A sub-set of these performance measures are reported to the Victorian Expenditure Review Sub-Committee (ERSC), including the setting of annual targets, as follows:

- **Output Technical Performance Measures**
PO-5, PO-6 and PO-7
- **Service Technical Performance Measures**
PS-3, PS-4, PS-5, PS-6, PS-7 and PS-8.

Figure 16: Business Uses of Technical Service



Table 3: Output Technical Performance Measures

No.	Name	Description	Measure	Current
PO-1	Resurfacing coverage across sealed network	The area of the sealed pavement network resurfaced (i.e. sprayed seal and thin asphalt), expressed as a percentage of the total sealed network area at the start of the financial year.	%	5.1
PO-2	Reseal coverage across sealed network	The area of the sealed pavement network resurfaced with a sprayed seal, expressed as a percentage of the total sealed network area covered by sprayed seal at start of the year.	%	New KPI
PO-3	Asphalt resurfacing coverage across sealed network	The area of the sealed pavement network resurfaced with a thin asphalt treatment, expressed as a percentage of the total sealed network area covered by asphalt at start of the financial year.	%	New KPI
PO-4	Pavement rehabilitation network coverage	The area of the sealed pavement network rehabilitated, expressed as a percentage of the total sealed network area at the start of the financial year.	%	0.4
PO-5	(ERSC Report) Road area treated: high strategic priority roads	Total square meters of renewal treatment, including rehabilitation and resurfacing, delivered within the financial year on Road Maintenance Category 1, 2 and 3 roads	m ² x 10 ³	New KPI
PO-6	(ERSC Report) Road area treated: medium strategic priority roads	Total square meters of renewal treatment, including rehabilitation and resurfacing, delivered within the financial year on Road Maintenance Category 4 roads	m ² x 10 ³	New KPI
PO-7	(ERSC Report) Road area treated: low strategic priority roads	Total square meters of renewal treatment, including rehabilitation and resurfacing, delivered within the financial year on Road Maintenance Category 5 roads	m ² x 10 ³	New KPI

Table 4: Service Technical Performance Measures

No.	Name	Description	Measure	Current
PS-1	LoS for rural network	Network length within intervention levels, including roughness, rutting and cracking, measured as a percentage of total road network length	%	New KPI
PS-2	LoS for urban network	Network length within intervention levels, including roughness, rutting and cracking, measured as a percentage of total road network length	%	New KPI
PS-3	Rural roughness intervention level	(ERSC Report) Road length meeting roughness standard: regional Rural Roughness less than agreed intervention level, measured as a percentage of total road network length	%	95.6
PS-4	Urban roughness intervention level	(ERSC Report) Road length meeting roughness standard: metropolitan Urban Roughness less than agreed intervention level, measured as a percentage of total road network length	%	92.6
PS-5	Rural rutting intervention level	(ERSC Report) Road length meeting rutting standard: regional Rural Rutting less than agreed intervention level, measured as a percentage of total road network length	%	97.4
PS-6	Urban rutting intervention level	(ERSC Report) Road length meeting rutting standard: metropolitan Urban Rutting less than agreed intervention level, measured as a percentage of total road network length	%	95.6
PS-7	Rural cracking intervention level	(ERSC Report) Road length meeting cracking standard: regional Rural Cracking less than agreed intervention level, measured as a percentage of total road network length	%	98.7
PS-8	Urban cracking intervention level	(ERSC Report) Road standard meeting cracking standard: metropolitan Urban Cracking less than agreed intervention level, measured as a percentage of total road network length	%	88.7

Table 5: Access Technical Performance Measures

No.	Name	Description	Measure	Current
PA-1	Speed Restriction service reduction	Length of network with speed restrictions, measured quarterly.	Km	New KPI
PA-2	Advisory Signage service reduction	Length of network with advisory warning signage, measured quarterly.	Km	New KPI

Table 6: Financial Technical Performance Measures

No.	Name	Description	Measure	Current
PF-1	Pavement Capital Spend – Renewals	<p>Renewal capital is expenditure on an existing asset or on replacing an existing asset, which returns the service capability of the asset up to that which it had originally (e.g. resurfacing or resheeting a material section of the road network, replacing a material section of a drainage network with pipes of the same capacity).</p> <p>Measured as a three-year rolling average of historical capital spend, excluding upgrade and expansion capital expenditure.</p> <p>Note: Historical definitions of road network maintenance expenditure covered both maintenance and renewal. Renewal expenditure (Capex) is not considered maintenance expenditure (Opex).</p>	\$ x10 ³	New KPI
PF-2	Pavement Recurrent Spend – Maintenance	<p>Maintenance is recurrent expenditure, which is regularly required as part of the anticipated schedule of works required to ensure that the asset achieves its useful life and provides the required LoS (e.g. defect patching, guard rail tensioning).</p> <p>Measured as a three-year rolling average of historical recurrent spend, excluding operations and depreciation expenditure.</p> <p>Note: Historical definitions of road maintenance expenditure covered both maintenance and renewal. Maintenance expenditure (Opex) excludes renewal expenditure (Capex).</p>	\$ x10 ³	New KPI
PF-3	Asset Renewal Funding Ratio	<p>The ratio of asset renewal and replacement expenditure for a period relative to the asset renewal and replacement expenditure identified as warranted in an asset management plan for the same period. It assesses the entity's asset renewal and replacement performance.</p> <p>Note: Where an entity does not yet have a reliable forecast of renewal requirements, it should cautiously adopt the Asset Sustainability Ratio as a substitute.</p>	%	New KPI
PF-4	Asset Sustainability Ratio	<p>The ratio of asset replacement expenditure relative to depreciation for a period. It measures whether assets are being renewed at the rate they are wearing out.</p>	%	New KPI

5.5.3 Intervention Criteria

DoT has a range of technical intervention criteria that are used to both trigger treatments in network level scenario modelling as well as monitor and report performance in the context of Technical Service Levels. The primary technical intervention criteria used to manage pavement and surfacing assets are as follows:

1 Roughness – a measured condition of the longitudinal smoothness of the road. This condition affects safety, road user costs, sensitive freight and DoT routine maintenance costs.

2 Rutting – a measured condition of the transverse shape of the road. This condition affects safety, road user costs (indirectly), sensitive freight and DoT routine maintenance costs.

3 Cracking – a measured condition of the extent of cracking of the road surface. This condition affects waterproofness, road user costs (indirectly) and DoT routine maintenance costs and is key criteria used to inform network preservation performance metrics.

4 Loss of Aggregate – a measure of amount of stone lost from the road surface. This measure affects skid resistance of the road.

5 Maintenance Patching – a measure of the extent of patching, which is a proxy for identifying low strength pavement. This measure affects whole of life pavement costs.

6 Loss of Texture – a measure of the extent of surface macrotexture between bituminous layer and top of surfacing aggregate. This measure affects road safety as a result of loss of macrotexture and associated increase of the risk of aquaplaning.

These intervention criteria are specific, measurable and able to be monitored over time. DoT have

monitored and reported these intervention criteria over more than a decade, including reporting of trends at Regional level. This provides a framework for benchmarking against future targets, for assessment of the effectiveness of the delivered program.

Intervention Levels are used to trigger specific renewal activities within sophisticated PMS models. In recognition of different customer needs and associated differences in road use and function across the Victorian arterial network, DoT has adopted scalable intervention levels based on the Road Maintenance Category definitions. Each combination of treatment option, Road Maintenance Category and Intervention Criteria has an intervention level set.

DoT is using a PMS to assist with modelling various investment scenarios (refer Section 4.3). Figure 17 lists the intervention levels used within the state-wide PMS modelling tool.

Maintenance and renewal of the road network is essential to the delivery of the Victoria Government’s objectives. There are two types of work activities adopted across the network, as follows:

- **Maintenance**
 - Often referred to as **routine maintenance**, comprises short term day to day work activities to address minor defects such as fixing potholes and identified defects.
- **Renewal** – inclusive of both periodic and rehabilitation treatments
 - **periodic** involves resurfacing to prevent water infiltrating the pavement structure and to improve the surface friction of the pavement surface.
 - **rehabilitation** involves a more significant treatment to improve the structural condition of the pavement and bring the pavement surface back to an acceptable condition.

DoT analytical modelling includes both periodic and rehabilitation renewal activities across the entire network. As described above, the scalable intervention criteria, by Road Maintenance Category, reflect

Figure 17: Indicative Network Wide Intervention Criteria

RMC Category	Periodic Intervention Resurfacing criteria	Renewal Intervention Rehabilitation criteria
Service Level 1	2.9 IRI roughness 10-12mm rutting >10% cracking	3.4 IRI roughness >12mm rutting No limit
Service Level 2	3.0 IRI roughness 10-12mm rutting >10% cracking	3.8 IRI roughness >12mm rutting No limit
Service Level 3	3.0 IRI roughness 12-15mm rutting >20% cracking	3.8 IRI roughness >15mm rutting No limit
Service Level 4	3.4 IRI roughness 12-15mm rutting >20% cracking	4.2 IRI roughness >15mm rutting No limit
Service Level 5	3.8 IRI roughness 12-15mm rutting >20% cracking	4.6 IRI roughness >15mm rutting No limit

the differing service levels related to differing requirements across the network. These intervention levels are configured as part of the state-wide PMS scenario modelling.

Network wide scenario modelling provides guidance on expected future performance across the whole of the Victorian arterial road network. DoT are committed to inclusion of feedback from across the State using local network knowledge. Regional modelling allows for the consideration of:

- network performance models representative of local materials, climate, demand etc.
- local network condition including routine maintenance costs and surface inspection rating
- available maintenance methods and industry capacity
- delivery efficiencies and regional co-ordination (i.e. road safety or improvement projects).

5.5.4 Standards

Road network standards have been developed and are applicable to the DoT arterial road network. These network configuration considerations include geometric standards such as horizontal and vertical geometry, lane width, seal width, shoulder requirements, etc. In consideration of the existing network portfolio, any deficiencies in road network standards present an opportunity to improve to LoS to road users

Any deficiencies in road network standards are generally not remediated via maintenance or renewal programs. As such, road network standards are not considered as part of analytical scenario modelling for pavement and surfacing assets. Accordingly, this Pavement Management Strategic Plan does not address deficiencies in existing network standards. Rather, deficiencies in road network standards are typically considered within Development strategies and within the DoT Improving the Network Sub-program.

6 / Business Area Planning

DoT has developed a comprehensive approach to investment related to asset preservation.

By adopting the corporate Asset Management Principles for the management of pavement assets, greater transparency in the annual planning function has been achieved. Vertical alignment of the performance metrics provides clarity to the regions of the outcomes.

The DoT approach to business area planning is best described as 'balanced'. This Pavement Management Strategic Plan outlines many of the key business activities that are required to deliver the various outcomes expected.

Commitment and overall direction of the Pavement Management Strategic Plan is provided by the DoT Director of Asset Management. Transport Assets conducts strategic planning functions for all arterial roads across the Victorian network. These functions:

- Feed up to the Department of Treasury and Finance to inform central government investment decisions, including the associated risk and service level implications; and
- Feed down to DoT regions to provide budget allocation advice, including performance measure targets to inform program development and delivery.

Regions conduct tactical planning functions for arterial roads within regional delegation. These functions:

- Feed up into strategic planning documents managed by Transport Assets; and

- Feed down to operational delivery services, also managed within Regions.

Figure 18: Business Alignment Schematic



6.1 Strategic Planning Overview

In 2016-2017 a comprehensive business case was prepared by Transport Assets, which outlined options for the long-term preservation of the pavement asset portfolio. This business case represented a step change in documentation of strategic planning practices for DoT. This business case outlined the community outcomes, risk and service level trade-off for a range of investment scenarios.

The development of this business case represents a step towards a more mature and sustainable strategic planning model for DoT, as shown in Figure 4 of Section 2.3. DoT intends to further evolve the current strategic planning model for the management of the pavement assets portfolio (and other asset types). As part of the continuous improvement journey, and to drive more sustainable strategic planning processes, DoT will develop other key documents in the future as follows:

Roads Asset Management Plan

- Prepared by Transport Assets
- Financial, risk and performance component updated annually
- Scope to include all Preservation, Operations and Development programs
- Inputs based on standard templates, to enable efficient collation, such as:
 - Regional Maintenance and Renewal Plans
 - Development and Operations forecasts from Planning and Programs
- Forms a key input into budget bids, such as Business Cases

Maintenance and Renewal Plans

- Prepared by Regions
- Financial, risk and performance component updated annually
- Scope to include Preservation programs only
- Based on a standard template developed by Transport Assets
- Forms a key input into the Roads Asset Management Plan

Business Cases

- Prepared by Transport Assets
- Informed by robust Asset Management Plans
- Developed / updated on an as needs basis
- May form key document submitted to TfV annually

- Victorian Government Budget requirements and time frames
- Victorian Government Capital and Recurrent budget guidelines
- Road network condition data updates
- Regional planning and procurement requirements
- DoT delivery models
- The impact of climate on the delivery of physical works
- Pavement renewal works (inclusive of both periodic resurfacing and pavement rehabilitation) are funded on annual basis coinciding with the financial year. At the time Transport Assets pass on annual allocation advice to Transport Services, the expected funding envelope for four years is also advised. That is, one year lock in and a further three years indicative allocation advice is provided to Transport Services. This allows Transport Services to conduct tactical planning functions with confidence and promotes more efficient development of the four year works programs. Central to the Annual Planning Process is the release of DoT Program Guidelines. Transport Assets will also provide guidance regarding target outcomes, data exchange protocols and any other key considerations. An indicative timeline for Regional annual business planning is presented in Figure 20.

6.4 Annual Performance Monitoring

For every dollar spent on the Victorian arterial road network, there is contribution to managing or improving service levels. That is, investment of funds results in a consequential change in network performance. Furthermore, the network performance naturally deteriorates over time as a result of road use and environmental factors.

For businesses responsible for large asset portfolios used to deliver core services, it is prudent to measure performance so that an informed assessment can be made of investment efficiency and effectiveness. As detailed in Section 5.5.2 of this strategic plan, DoT has adopted a range of technical service levels to allow consistent measurement of performance over time. These technical performance measures are categorised as follows:

- Output measures;
- Service measures;
- Access measures; and
- Financial measures.

DoT will prepare an Annual Performance Report, covering all performance measures in Section 5.5.2, in order to transparently report network performance to stakeholders. Stakeholders to whom this annual performance report will be distributed include the following as a minimum:

- DoT Executive
- Asset Management – Transport Assets
- Transport Services

The Annual Performance Report, or sections of it, may also be used to assist with assurance reporting to other government agencies and advocacy groups such as:

- Department of Environment, Land, Water and Planning (DELWP)
- Department of Treasury and Finance (DTF)
- Victorian Auditor General's Office (VAGO)
- Royal Automobile Club of Victoria (RACV)

The first version of the Annual Performance Report (i.e. 2017) will:

- Clearly define all performance measures, to remove potential ambiguities
- Assess current and historical (minimum four years) performance; and
- Exclude the setting and assessment of targets.

This first version will be a critical document to inform DoT of performance and assist with the task of setting targets for each performance measure. The second and subsequent versions of this Annual Performance Report will include an evaluation of each performance measure against agreed targets.

Figure 20: Annual Business Planning Timelines for Transport Services



7 / Improvement Plan

DoT embraces continuous improvement as an integral aspect of this Pavement Management Strategic Plan.

Continuous improvement of processes, personnel and technology is a primary way to ensure the asset portfolio enables delivery of community services safely, effectively and efficiently.

The DoT Asset Management Strategic Framework (under development at the time of writing this strategic plan) gives overarching guidance for whole of organisation continuous improvement priorities.

7.1 Improvement Action List

DoT is currently undertaking and planning various improvement initiatives to further enhance pavement management processes and associated road user outcomes. Any changes, additions or reprioritisation of improvement initiatives within the pavement management improvement plan will be under the oversight of the DoT Asset Management Capability Improvement.

7.2 Governance

To ensure clear accountabilities and responsibilities for implementation, governance is critical. There are differing levels of governance associated with implementation of this Pavement Management Strategic Plan, as follows:

- **Asset Management Steering Committee** – accountable for approval of the Pavement Management Strategic Plan, as well

as implementation oversight and subsequent evaluation of success;

- **Director Asset Management** – responsible for development, update and implementation of the Pavement Management Strategic Plan, including collaboration with Transport Services as well as the broader integration with improvement initiatives being delivered by Asset Management Capability Improvement;

Terms of Reference will be further developed to provide greater transparency and clarity of function. In consideration of other asset type groups, as outlined in Figure 3, the governance structure outlined above may be further streamlined in the future in accordance with recommendations from the Asset Management Capability Improvement Team.

7.3 Monitoring and Review

This strategic plan will undergo a major review every three years, to ensure alignment with the DoT Corporate Plan.

The improvement opportunities within this strategic plan will be prioritised by the Asset Management Capability Improvement project and an action plan implemented.

