Western Cape Government

Department of Transport and Public Works
Road Asset Management Plan

Volume 1 and 2 for 2022/23 to 2031/32

Western Cape Government

Roads Branch

Road Asset Management Plan for 2022/23 to 2031/32

Department of Transport and Public Works

For further information, please contact:

Chief Directorate Road Programme Management

Department of Transport and Public Works

9 Dorp Street
CAPE TOWN
8001

Private Bag X9185
Cape Town
8000

Tel: +27 21 483 5400

Email: transport.publicworks@westerncape.gov.za

Website: www.westerncape.gov.za

Cover Picture by Mr Azni Khail November from Western Cape Government.

EXECUTIVE SUMMARY

This Road Asset Management Plan (RAMP) seeks to strengthen the alignment between the activities of the Roads Branch, the Strategic Goals of the Department of Transport and Public Works, and the Western Cape Government. The purpose of this RAMP is to:

- set out the elements of road infrastructure assets managed by the Branch;
- consider the required level of service to be provided by the infrastructure;
- indicate the level of service actually provided;
- assess the level of service gap and how to address this gap;
- estimate the financial resources required;
- provide details of the organisational and support plan structure;
- show how the infrastructure is managed and monitored;
- demonstrate responsible management;
- communicate and justify funding requirements;
- demonstrate compliance with regulatory requirements; and
- state the Plan's limitations.

Objectives and Policy

The asset management objectives are derived from the Branch's Strategic Objectives. These asset management objectives are to:

- maintain road assets to ensure that roads are safe and smooth for private motorists, road-based public transport, and commercial vehicles;
- optimise asset preservation over the long term;
- prioritise road asset investments that support economic growth;
- improve road asset performance to reduce agency and user costs; and
- provide new asset capacity where demand exceeds capacity.

These objectives are supported by an Asset Management Policy that is based on international standards. This policy sets the direction and framework required for sustainable, road-related asset management and commits the Branch to continual improvement in asset management practices and asset management performance.

Asset management policy is implemented through the following strategies:

- road system performance;
- capital investment;
- road infrastructure preservation; and
- road use.

Currently, the preservation and some road use strategies are implemented. The capital investment strategies have been initiated. These three strategies will form the base of the road system performance strategy.

RAMP provides an assessment of the current level of asset management in the Branch. The maturity level according to THM 22 (Committee of Transport Officials, 2013) of asset management for road assets was assessed as "reasonably advanced" with some areas needing improvement, while the structures and other road assets were generally less mature with most areas needing improvement.

Asset management approach and levels of service

The RAMP provides a detailed description of the asset management approach that includes a summary of the levels of service and standards used. The approach strives to implement international best practice in asset management as well the learnings from the practical application of asset management in other road authorities.

Situation analysis

The RAMP provides a comprehensive view of the current state of the Branch's road infrastructure assets in terms of the levels of service, network conditions, asset value, and vehicle operating costs. Relevant trends of surveillance data are presented and discussed, the performance gap is determined, and the long-term consequences of applying the current Medium Term Expenditure

Framework (MTEF) Budget and various other funding mechanisms is discussed.

The road network is described in detail in the report. In addition, the levels of service pertaining to the types of surveillance measurements and the road classifications are described. The vast majority (73%) of pavement ages are older than 25 years, and thus only 27% of the pavements are still operating within their design life. The total usage for the paved network is 19,6 million vehicle-km per day and 0,96 million vehicle-km per day for the unpaved network, totalling 20,56 million vehicle-km per day, or 7,5 billion vehicle-km annually.

A comprehensive account of the engineering and functional condition of the road network is provided in the report. The network is classified into five classes according to the Road Classification and Access Management (RCAM) Manual. Smooth Travel Exposure (based on 2016 data) indicates less than satisfactory travel conditions for all RCAM classes. This reflects the age of the current network and the low rate of rehabilitation. Based on low rut exposure (LRE), acceptable safety conditions were found for all RCAM classes. There is less than satisfactory High Texture Exposure for RCAM classes 1, 2 and 3. This can be ascribed to the age of the seals on these roads.

In 2020, user cost in terms of total vehicle operating cost was R59 billion and excess vehicle operating cost was R16,6 million. The latter represents only 0,03% of total vehicle operating cost.

In 2020, the current replacement cost of the road network was calculated as R179 billion and the depreciated replacement cost was calculated as R141 billion. These values exclude all bridge and other structures as no valuation is currently available.

The Network Condition Number (NCN) provides a measure of the visual condition of the paved network and is weighted by length and vehicle-km. NCN weighted by length has improved significantly over the previous 2 years, however the last two years slight deterioration is shown with the average NCN at 72.1% which is still above the target of 70. NCN weighted by vehicle-km has been between 10 and 15% better than the NCN weighted by length, however this difference decreased further in 2019 to just 0,7%. This small difference is a measure of how effectively the Branch maintains the network for the benefit of the users, i.e. the objective to provide a greater benefit experienced by the users.

The trend in the NCN for the unpaved network weighted by length has steadily deteriorated over the last 4 years, but reversed in 2017 with a NCN of 55 in 2019, which is significantly below the target of 60. The unpaved network has very limited gravel-wearing course and the thickness averages 19 mm, well below the desirable average of 75 mm.

There has been an upward trend in the Reseal Condition Number (RCN) over the last 10 years. However, the latest data show that the RCN has decreased significantly from 47,4 in 2017 to 40,2 in 2019, and it has stabilised on this level related to the latest data. This is also reflected in the increased need for immediate resealing.

Needs determination

Infrastructure maintenance needs were determined by means of a lifecycle benefit-cost analysis that includes optimisation of technical solutions over the lifecycle of each asset and for each project in the network. This was done for four budgets using appropriate maintenance and rehabilitation strategies. Insight was gained into the optimal means to fill the gap between the current and the desired levels of service. The four budgets analysed are:

- the Provincial MTEF Budget - the current funding level;
- an Optimised Provincial MTEF Budget – the optimised current funding level;
- a Technical Needs Budget – a theoretical funding level that achieves the required level of service immediately; and
- an Intervention Budget – a funding level that will achieve the required levels of service within a reasonable time period.

The results of these four budgets are shown below. The Provincial MTEF Budget can easily be compared with the results of the three optimised budgets for each work type.

The consequences of the four budgets in terms of the performance of the road network were analysed and the Intervention Budget was selected as the desired budget for funding the maintenance and rehabilitation of the network.

Average 5-year Provincial MTEF Budget, Rand (millions)						
Re-gravel	Upgrade to Paved	Reseal	Light Rehab.	Rehab.	Other[1]	Total
116	232	471	451	257	2424	3 951
Average 5-year Optimised Provincial MTEF Budget Rand (millions)						
32	13	345	729	410	2424	3 953
Average 5-year Technical Needs Budget Rand (millions)						
1 251	929	1 029	-	4 584	2424	10 217
Average 5-year Intervention Budget Rand (millions)						
869	631	362	1011	827	2424	6124
Average annual shortfall between the MTEF and Intervention Budget, Rand (millions)						
753	399	-109	559	570	-	2 172
Note 1: Committed construction projects and routine maintenance activities are currently excluded from the lifecycle benefit-cost analysis.						

The average Intervention Budget over the next 5 years is R6,124 billion per annum. The required funding level of the Intervention Budget is R 2,172 billion per annum more than MTEF funding level over the next 5 years.

The current shortfall between the MTEF Budget and the Desired Budget is R4,2 billion per year over the next 10 years. This shortfall includes the requirements for the intervention budget, new infrastructure and the upgrading of existing paved road infrastructure.

The combined Asset Sustainability Ratio for the period 2014/15 to 2017/18 is 9,64%, compared with a desirable value of 50%. This highlights inadequate expenditure on renewing the network.

Currently the Branch identifies new regional infrastructure, through multiple processes. Feasible projects are prioritised and combined into a programme input to road investment. In future, the Western Cape Transport model will supply the information required for compiling a Demand Management Plan that will be the basis for determining a comprehensive list of these priorities.

Asset management plans

Asset management plans are provided for:

- renewals and replacement of roads; and
- new facilities and upgraded roads.

The objectives of the Expanded Public Works Programme and Provincial Road Maintenance Grant are included in the asset management plans listed above.

A Forward Works Programme is provided for road projects.

Financial summary

Full details of cash flow forecasts and desired funding estimates are provided for the period 2022/23 to 2031/32. Various sources of funding are examined, but the only realistic additional source of funding remains increased allocations from Provincial Treasury.

Asset management enablers

The role of asset management systems, together with asset information management, is a key enabler for effective asset management of the road network. An effective asset information management system ensures that the right information is available to the right users at the right time to support business objectives. Details of the framework for the management of asset information systems are discussed in the RAMP as well as the current IT Steering Committee to guide and direct all systems development in the Branch. The purpose and output of all road asset management systems is described, and categorised in terms of strategic, tactical and operational context. An evaluation of information availability and analysis capability indicates a high level of performance. The Branch continues to make more effective use of this data to improve the quality and scope of management information.

To support delivery, details of the organisational and support structure are discussed in the report. These include the enablers of:

- procurement and supply chain management – a good relationship enables alignment of procurement and supply chain management with asset management objectives and strategy.
- asset management leadership – the evaluation of leadership using the asset management maturity assessment tool is a high priority to identify gaps.
- organisational structure – The new organogram was approved and the filling of the new posts is essential to support the organisation with delivery.

- organisational culture – evaluation of culture using the asset management maturity assessment tool is a high priority to identify hindrances to effective delivery.
- Competence management – improving the skills of Branch staff to achieve competence in asset management is a high priority.

Competence management is the processes of systematically developing and maintaining an adequate supply of competent and motivated people to enable the fulfilment of asset management objectives. A framework for competence management is provided by the Institute of Asset Management. It can be used to assist with:

- writing or reviewing job descriptions;
- planning recruitment;
- defining selection criteria;
- identifying individual learning and development needs;
- managing individual and team performance;
- career planning; and
- performance review.

The skills development programme for engineers, technologists and technicians has been a success over the last 12 years with 39 graduates achieving registration with the Engineering Council of South Africa.

Social responsibility

The Branch strives to enhance job creation, training and contractor development in the delivery of projects.

Strengths, weaknesses, opportunities, threats (SWOT)

A SWOT analysis revealed the following:

- Asset management has significant strengths, but weaknesses with respect to aligning projects with strategic objectives. These weaknesses are being addressed.
- Well-developed asset information systems provide high-quality information. However, additional systems are needed to address the gaps.
- The current management team and professionals are dedicated and capable, but key positions remain vacant.
- Funding remains a key weakness for delivering priority projects.
- Challenges in the filling of posts within the new organisational structure are of a concern and needs to be urgently concluded for the recruitment of staff to commence.

Risk analysis

A risk analysis has identified the following institutional issues that require urgent mitigation:

- under-funding of maintenance, renewals and economic projects;
- organisational sustainability in terms of:
  - difficulty in attracting and retaining professional staff;
  - barriers to succession planning;
  - the large number of vacant posts undermining the ability of the Branch to manage its assets;
  - limited new appointments due to limitations on cost of employment;
- asset information governance;
- a change in the managing authority for borrow pits to the Department of Mineral Resources, causing delays in approvals
- lack of internal environmental expertise; and
- Staff are exposed to dangerous working areas in fulfilling their normal duties.

The infrastructure-related risks affecting the future economic viability of the road network of Western Cape are:

- suboptimal use of funds due to the exclusion of routine maintenance and new assets from the optimisation process;
- underperformance on national job creation targets;
- deteriorating condition of the road network to below acceptable levels of service;
- traffic demand on the network leading to congestion in the metropolitan area;
- impacts of climate change;

- scarcity of gravel and base aggregates;
- scarcity of water for compaction; and
- variable quality of bitumen supply.

Conclusions

- The Branch has provided a detailed analysis of the needs of the network and determined the minimum funding required for sustainability that will provide the levels of service required to support the economy of the Western Cape.
- This minimum funding is approximately R4,2 billion per year more than provided in the MTEF Budget over the next 10 years.
- Staffing of the Branch is critically low, jeopardising effective management of the road network.
- The Branch's asset management systems provide excellent support for effective management of the Branch.

Recommendations

It is recommended that the Branch should focus on the following issues to address the preservation of the network as effectively as possible for the available MTEF budget:

- expand the scope of work that is optimised in the Branch's resource allocation system;
- review level of service targets where appropriate;
- ensure the most appropriate design and delivery solutions are consistently chosen and implemented to appropriate standards;
- improve the effectiveness and efficiency of high-priority preservation and maintenance activities to reduce the rate of deterioration of the network, by:
    - waterproofing the network with reseals;
    - prioritising preventive over reactive maintenance; and
    - providing effective maintenance management to agreed levels of service and standards;
- minimise overheads;
- construct additional weighbridges to deter overloading; and
- implement measures to update information on bridges and other structures, including their asset value.

With respect to enabling the Branch, it is recommended that:

- The immediate filling of posts and sourcing of staff within the new organogram micro-structure to minimise the impact on service delivery;
- Utilise the asset management maturity assessment in accordance to TMH 22 (Committee of Transport Officials, 2013), to assist the Branch in identifying gaps and creating action plans for improving asset management; and
- Systems improvements are implemented to close identified gaps.

ROAD ASSET MANAGEMENT PLAN

2022/23 TO 2031/32

VOLUME 1: THE PLAN

DEPARTMENT OF TRANSPORT & PUBLIC WORKS

ROADS BRANCH

The **APPENDICES** can be found in **Volume 2** of the **Road Asset Management Plan**

The Western Cape Government, Department of Transport and Public Works has a matured level of road asset management and compiled a comprehensive Road Asset Management Plan (RAMP) as outlined in the table of contents above. A comparative evaluation between the "standard table of contents" submitted by National Department of Transport (NDOT) on the 19 October 2019 and this document's outline is provided in Appendix O, to show compliance with NDOT requirements and to guide the reader to the relevant sections of RAMP.

FIGURES

TABLES

PICTURES

Note: This document is formatted according to the corporate branding of the Western Cape Government. The colour palette used can be found in Appendix R– Corporate Branding.

ACRONYMS

ABACUS	As built acceptance control utility system	EIA	Environmental impact assessment
AADT	Annual average daily traffic	EPWP	Expanded Public Works Programme
AIMS	Asset Information Management System	EUC	Excess user cost
AUC	Area-under-the-condition-curve	FTE	Full time equivalents
AAUC	Augmented-area-under-the-benefit-curve	FWD	Falling weight deflectometer
AFR	Asset Fund Reserve	FWP	Forward Works Programme
ASR	Asset sustainability ratio	GMFAM	Global Forum on Maintenance and Asset Management
BAS	Basic Accounting System	GIAMA	Government Immovable Asset Management Act
B&SMS	Bridge and Structures Management System	GIS	Geographic information system
CBD	Central business district	GRMS	Gravel Road Management System
CAPEX	Capital expenditure	GROMAMAS	Gravel Roads Maintenance Management System
CIDB	Construction Industry Development Board	GPSSBC	General Public Service Sector Bargaining Council
CoCT	City of Cape Town	HSWIM	High speed weigh-in-motion
COE	Cost of employment	HDM III	Highway Design and Maintenance Standards Model version III
CRC	Current replacement cost	HDM-4	Highway Development and Management system version 4
CSIR	Council for Scientific and Industrial Research	HTE	High texture exposure
DSL	Decision support level	IAM	Institute of Asset Management
dTIMS/ dTIMS™CT	Deighton Total Infrastructure Management System	IDMS	Integrated Design Management System
DRC	Depreciated replacement cost	IDP	Integrated development planning
DSC	Design standard certificate	IDZ	Industrial development zone
DM	District municipality	IMMS	Integrated Maintenance Management System
DCP	Dynamic cone penetrometer	IPAS	Integrated Provincial Accident System
DMR	Department of Mineral Resources	IPS	Infrastructure Preservation Strategy/ Integrated Procurement System
DPSA	Department of Public Service and Administration	IRR	Internal rate of return
DRE	District Roads Engineer	ITP	Integrated transport plan/ integrated transport planning
DTPW	Engineering Council of South Africa	JV	Joint venture
ECSA	Engineering Council of South Africa	KPI	Key performance indicator
EmpIA	Empowerment impact assessment	LCBCA	Life cycle benefit-cost analysis

ACRONYMS

LCCA	Life cycle cost analysis	PM	Periodic maintenance
LC	Lifecycle costing	PMS	Pavement Management System
LOS	Level of service	PQMS	Pavement Quality Management System
LRE	Low rut exposure	PCI	Pavement Condition Index
LSWIM	Low speed weigh-in-motion	PDP	Professional Development Programme
LTPPMS	Long Term Pavement Performance Maintenance System	PLTF	Provincial Land Transport Framework
LVR	Lifecycle value realisation	PRMG	Provincial Road Maintenance Grant
M&R	Maintenance & Renewal	PSDF	Provincial Strategic Development Framework
MEDS	Micro Economic Development Strategy	PSG	Provincial Strategic Goal
MIMS	Materials Information Management System	RNIS	Road Network Information System
MMS	Maintenance Management System	ROPE	Road Network Information System
MSDF	Municipal Spatial Development Framework	RCI	Reseal condition index
MTAB	Metropolitan Transport Advisory Board	RCN	Reseal condition number
MTEF	Medium Term Expenditure Framework	RAMP	Road Asset Management Plan
NATMAP	National Transport Master Plan	RAMS	Road Asset Management System
NDP	National Development Plan	RCAM	Road Classification and Access Management Manual
NCN	Network condition number	RIS	Roads Investment Strategy
NDOT	National Department of Transport	RISFSA	Road Infrastructure Strategic Framework
NLTA	National Land Transport Act	RM	Routine maintenance
NLTSF	National Land Transport Strategic Framework	RSMS	Road System Management Strategy
NLTTA	National Land Transport Transition Act,	RUMS	Road Use Management Strategy
NSDF	National Strategic Development Framework	SANS	South African National Standard
OD	Organisation design	SANRAL	South African National Roads Agency SOC Ltd.
OPEX	Operational expenditure	SARSAM	South African Road Safety Audit Manual
OSD	Occupation Specific Dispensation	SITA	State Information Technology Agency
PEMS	Plant and Equipment Management System	SPADS	Seal Planning and Design System
PAS	Provincial Accident System	SR	Spot regravel
PDI	Previously disadvantaged individual	STE	Smooth Travel Exposure
PFMA	Public Finance Management Act	SWOT	Strengths, weaknesses, opportunities, threats

ACRONYMS

TCS	Traffic Counting System	VO	Value optimisation
TDA	Transport and Urban Development Authority	VOC	Vehicle operating costs
TMH	Technical Methods for Highways	VOCS	Vehicle Operating Cost System
TRH	Technical Recommendations for Highways	WCG	Western Cape Government
TTC	Total transport costs	WCTM	Western Cape Transport Model
VCI	Visual Condition Index		

GLOSSARY

ABACUS	The operations-level application for the acceptance control of layerworks
Asset Information Management System	The system that defines and manages the use of asset information
Asset Fund Reserve	A reserve of funds obtained from Provincial Treasury for funding new strategic network improvements that support economic growth
Asset sustainability ratio	A ratio that is a measure of sustainability of the road network
Bridge and Structures Management System	The strategic information system for management of bridges and large culverts (formerly referred to as the Bridge Management System – BMS)
Current replacement cost	The maximum theoretical asset value.
Deighton Total Infrastructure Management System	The term dTIMS or dTIMSTMCT, refers to Deighton Associates life cycle cost optimisation software. The software is customised with the HDM pavement performance models, calibrated for the conditions in the Western Cape. It is used to predict the future consequences of maintenance and funding policies
Depreciated replacement cost	The current asset value, depreciated according to the condition of the road, or other method
Design standard certificate	A certificate which provides the design standards to be used on a road construction project
District municipality	In the Western Cape, these are: Cape Winelands, Garden Route, Overberg, Central Karoo and West Coast. For convenience, the City of Cape Town, although a metropolitan rather than a district municipality, has been included in the charts with the district municipalities
Dynamic cone penetrometer	An instrument for determining the resistance to penetration of a steel cone
Environmental impact assessment	An assessment of environmental impact required by environmental legislation
Empowerment impact assessment	An assessment of economic empowerment impact required by labour legislation
Expanded Public Works Programme	A national programme run in the Western Cape by the Department of Transport and Public Works
Excess user cost	Incremental road user cost on paved roads that is avoidable. This cost covers delays, accidents, and VOC. In this report, only VOC is used and EUC is the incremental cost incurred where the roughness exceeds an IRI of 3,1
Forward Works Programme	The Forward Works Programme contains the list of optimised projects according to the delivery priority

GLOSSARY	
Full Time Equivalents	A full time equivalent job (FTE) refers to one person-year of employment. One person-year is equivalent to 230 person days of work. Person-years of employment = total number of person days of employment created for targeted labour during the year divided by 230. For task-rated workers, tasks completed should be used as a proxy for 8 hours of work per day.
Geographic information system	A system designed to capture, store, manipulate, analyse, manage, and present spatial or geographic data
Gravel Road Management System	The strategic information system for unpaved roads
Gravel Roads Maintenance Management System	Tactical and operational management information system that is integrated with ROPE to manage periodic maintenance of the unpaved road network
High speed weigh-in-motion	Technology used to measure the mass of passing vehicles
Highway Development and Management system version 4	A software system and models that are used to investigate road transport infrastructure
High texture exposure	The percentage length of road exposed to high texture
Integrated Maintenance Management System	The tactical and operational information management system for costing of works in the Branch
Integrated Provincial Accident System	A strategic information system for analysing accidents on roads
International Roughness Index	Measurement in mm/m to indicate the riding quality of pavements
Intervention levels	The level at which it is necessary to intervene with a treatment, such as resealing, rehabilitation, regravelling, etc.
Lifecycle benefit-cost analysis	An analysis performed to determine the predicted performance and needs of a road network for predefined funding and policy approaches
Lifecycle costing	The analysis of cost implications for an asset or asset system over the organisation's period of responsibility
Life cycle cost analysis	An analysis that takes account of costs throughout the life cycle of the asset
Level of service	The desired level at which the service is provided
Long Term Pavement Performance Maintenance System	The system used to assist with the calibration of the HDM models
Low rut exposure	Low rut exposure is the safety efficiency of road system performance. It is the proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads
Lifecycle value realisation	The optimisation of both lifecycle costs and the value obtained from assets over the organisation's period of responsibility
Maintenance & Renewal	A roads budget that would allow for adequate maintenance and renewal
Maintenance	In this report, "maintenance" refers to the activities of regraveling, resealing, rehabilitation and upgrading to paved standards. Routine maintenance is excluded from the maintenance activities addressed in this report. The activities to rehabilitate paved roads and upgrade unpaved roads to paved standards are not strictly maintenance activities, but are included in the term "maintenance" for the purposes of this analysis report
Materials Information Management System	A tactical and operational information system for the management of material sources
Maintenance Management System	A system to assist with routine maintenance operations

GLOSSARY	
Medium Term Expenditure Framework	The budget framework used by the Provincial and National Treasuries
National Development Plan	National Development Plan 2030: Our Future: Make it Work. (National Planning Commission, Department of the Presidency)
Net present value	The difference between the present value of the future cash flows from an investment and the amount of investment. Present value of the expected cash flows is computed by discounting them at the required rate of return
Network condition number	A measure of the visual condition of the road network. See TRH 22, 1994, "Pavement Management Systems", CSRA, for further details
Occupation Specific Dispensation	Department of Public Service and Administration circular for remuneration of specified occupations including engineers, engineering technologists and technicians
Passability	The ability of traffic to pass over the road. Where conditions prevent traffic crossing a road, it is called impassable
Paved	Refers to upgrading of unpaved roads to paved standards
Paved roads	Refers to the roads managed by the Pavement Management System of the Western Cape Government
Plant and Equipment Management System	The system that assists with the management of plant in equipment
Provincial Accident System	The system that assists with the capture of accident data
Periodic maintenance	Planned maintenance that happens at frequencies from annually up to 15 years, depending on the condition of the asset. This includes resealing, regravelling and may also include activities such as planned cleaning of pipe culverts and side drains
Pavement Management System	The strategic information system for management of paved roads
Pavement Quality Management System	The system used to manage the quality of pavements in the Western Cape
Pavement Condition Index	An index that measures the condition of the pavement
Professional Development Programme	The development programme for engineers and technicians to assist them in obtaining professional registration
Provincial Road Maintenance Grant	A conditional grant provided by National Treasury
Provincial Roads Branch	The Branch of the Department of the Western Cape Government responsible for the management of the province's roads, excluding national roads and urban roads
Provincial Strategic Goal	Goals defined in the Western Cape Provincial Strategic Plan 2019 – 2024
Reconstruction	A renewal of the road where the vertical and/ or horizontal alignment is improved and/ or the width is increased, perhaps by the addition of shoulders. In addition, one or more pavement layers are improved and/ or an additional layer/ s is/ are added. Through reconstruction, the structural capacity of the pavement is increased
Regional Operational Planning and Execution	Tactical and operational information system for maintenance management of routine maintenance
Regravel	Periodic maintenance by replacing the gravel-wearing course of an unpaved road

GLOSSARY	
Rehabilitation	A renewal of a road where one or more pavement layers are improved and/ or an additional layer is added. Through rehabilitation, the structural capacity of the pavement is increased
Resealing	Periodic maintenance of a paved road by waterproofing the surface of a road. This includes chip seals and asphalt surfacing
Reseal condition index	An index that measures the condition of chip seals
Reseal condition number	A number that measures network condition of chip seals
Reset values	The value of a pavement performance measure (e.g. distress), after a treatment
Road Asset Management Plan	A strategic asset management plan for the road network
Road Asset Management System	All systems making up the road asset management system
Road Classification and Access Management Manual	TRH26: South African Road Classification and Access Management Manual – version 1.0 August 2012
Roads Investment Strategy	The Road Infrastructure Preservation Strategy translate road system performance objectives that are driven by community outcomes to priorities for managing the condition of road system assets
Road Infrastructure Strategic Framework	Road Infrastructure Strategic Framework for South Africa, Department of Transport, 2006. A framework for the classification and management of road networks in South Africa
Road length	Refers to the carriage way road length in kilometres, not the distance of the road network. The road length of a dual carriageway is therefore double the distance of the road because the pavement structures of the two carriageways are investigated separately in the Pavement Management System
Road network	Refers to all roads managed via the Pavement and Gravel Roads Management Systems of the Western Cape Government
Road Network Information System	The strategic information system for managing the location of the road network of the Branch
Routine maintenance	Routine maintenance is the day-to-day maintenance of the road surface, the drainage and the road reserve
Road System Management Strategy	Road System Management Strategy examines the community needs and expectations for the performance of all assets comprising the road system and establishes an over-arching hierarchy of performance-based levels of service and future vision of fit-for-purpose standards for the configuration, capacity, use and condition of the various road network assets
Road Use Management Strategy	Road use management strategies provide a framework for the management of road use, particularly for specific road user groups, such as freight vehicles, public transport, port access, and mining-related cartage
SealPro	The operational level application used for controlling the construction of seals
Seal Planning & Design System	A system that assists with the planning and design of chip seals
Spot regravel	Regravelling of short sections of road, also called large-scale patching
Smooth Travel Exposure	The proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads
Traffic Counting System	A strategic information system for management and storage of traffic counts
Total transport cost	The total cost of transport including vehicle operating costs and agency costs
Unpaved roads	Refers to the roads managed by the Gravel Roads Management System of the Western Cape Government

GLOSSARY	
Visual Condition Index	The index for visual condition according to TMH 9: Pavement Management Systems: Standard Visual Assessment Manual for Flexible Pavements (Committee of State Road Authorities, 1992)
Value optimisation	Considers the value of the asset system in addition to asset costs
Vehicle operating costs	Costs that vary with vehicle usage, including fuel, tyres, maintenance, repairs, and mileage-dependent depreciation costs. Projects that alter vehicle distance travelled, traffic speed and delay, roadway surfaces, or roadway geometry may affect travellers' vehicle operating costs, which should be considered in a benefit-cost analysis
Vehicle Operating Cost System	A system used for determining vehicle operating costs developed by the Branch
Western Cape Government	The provincial government of the Western Cape
Western Cape Transport Model	The envisaged transport model to be created for the Branch

Chapter 1 - Introduction

The road network provides a foundation for sustaining the infrastructure of the Western Cape, thereby supporting economic and social development. The Western Cape Government Roads Branch ("the Branch") is inevitably faced with the challenge of trying to balance competing demands in a constrained budget environment that does not support desired levels of service.

This Road Asset Management Plan (RAMP) seeks to strengthen the alignment between the activities of the Branch with the strategic goals of the Department of Transport and Public Works and the Western Cape Government and attempts to address some of the critical questions in managing roads infrastructure, such as:

- What is the quantum of funding required for a specified level of service?
- Is it possible to preserve the road assets to current performance standards given the available fund allocation?
- How should the available funds be split between the many needs and responsibilities of the Branch, to ensure optimal benefit for both road users and the Branch?
- What is an economic level of funding for asset preservation?

The RAMP provides the information in accordance with the draft TMH 22 template (Committee of Transport Officials, 2013), which was based on the draft of ISO 55001:2014 *Asset management - Management systems – Requirements*, which has been adopted without change as SANS 55001:2015 (International Standards Organization for Standardization, 2015). The purpose of this RAMP is to address the following issues that constitute a statement of the problem:

- set out the elements of road infrastructure assets managed by the Branch;
- consider the required level of service to be provided by the infrastructure;
- indicate the level of service actually provided;
- assess the gap in level of service and how to address this gap;
- estimate the financial resources expected;
- provide details of the organisational and support plan structure;
- show how the infrastructure is managed and monitored;
- demonstrate responsible management;
- communicate and justify funding requirements;
- comply with regulatory requirements; and
- state the Plan's limitations.

In response to this challenge, the RAMP provides a comprehensive view of the Branch's current state of the road infrastructure assets in terms of the levels of service, network conditions, asset value, vehicle operating costs and trends, the performance gap and the long-term consequences of applying the current and other funding levels to maintain the road network assets.

Paragraphs that are marked in the margin with a green bar (see left) indicate future developments or intended course of action.

1.1 Background

1.1.1 The Owner of the road infrastructure and Road Authority

The owner of the provincial road infrastructure in the Western Cape is the Western Cape Government. The custodian is the Department of Transport and Public Works, Roads Branch ("the Branch").

1.1.2 Preparation of the Road Asset Management Plan

This RAMP was updated by a team comprising of staff and consultants:

- A November Pr. Eng. BSc Eng. (Hons) (UCT)
- H Uys Pr. Tech. Eng. BSc (Hons) Civil Eng. (UP), BTech. Civil Eng. (CUT), NDip. Civil Eng. (CUT)
- H Coetzee Pr. Eng. BSc Eng. (SU)
- M Hofmeyr Pr. Eng. M.Eng. (SU)
- W Moolman Pr. Eng. (SU)
- M van Wyngaardt Pr. Eng. B. Eng. (Industrial) Hons (Industrial) University of Pretoria
- Riaan Burger Pr. Eng. M. Eng.

1.1.3 Purpose

The purpose of this RAMP is to:

- set out the elements of infrastructure assets managed by the Branch;
- consider the required level of service to be provided by the infrastructure;
- indicate the level of service actually provided;
- assess gaps in level of service and how to address these gaps;
- estimate the financial resources expected to be made available;
- demonstrate how the infrastructure is managed and monitored;
- demonstrate responsible management;
- communicate and justify funding requirements; and
- comply with regulatory requirements.

Finally, this RAMP seeks to further strengthen the alignment between the activities of the Branch and the vision-inspired priorities of the Western Cape Government.

1.1.4 Service delivery model

The service delivery model comprises the following elements:

- planning, in which needs are identified using both own resources and consulting engineers;
- design of solutions using both own resources and consulting engineers;
- preparation of a Roads Programme using own resources;
- delivery of the projects and programmes in the Roads Programme with own resources and on contract;
- management of the use of the road network using own resources; and
- measurement of performance across all phases using both internal and external resources.

1.2 Goals and objectives of the RAMP

The goals and objectives of the RAMP are to communicate the Branch strategy that supports the Department of Transport and Public Works (DTPW) vision and mission (Department of Transport and Public Works, 2020) . The DTPW strategic vision and mission are:

Vision

"Enabled communities leading dignified lives.

#JUSTdignity."

Mission

"To tirelessly pursue the delivery of infrastructure and transport services that are: inclusive, safe and technologically relevant, seeking to heal, skill, integrate, connect, link and empower every citizen in the Western Cape, driven by passion, ethics and a steadfast commitment to the environment and people as our cornerstone"

Strategic and departmental goals

The Strategic Objective indicators and targets are higher order indicators that are linked to the strategic objectives in the Strategic Plan (Department of Transport and Public Works, 2020). These indicators are developed into the 2022/23 Annual Performance Plan (Department of Transport and Public Works, 2022) for the Branch.

Note: The indicators are currently output-based and this drives efficiency regardless of effectiveness in moving closer to the Department's vision. The inclusion of outcome-based indicators will incentivise outcomes that are more closely aligned with the DTPW vision. This will encourage the Branch to improve the alignment between the Roads Programme and the Branch strategic objectives and, in turn, promote both effectiveness and efficiency in moving closer towards the DTPW vision.

Branch Strategic Objectives

To achieve the stated Departmental vision, two strategic objectives were adopted by the Roads Branch:

- to enable an efficient road-based transport infrastructure network[1] through maintenance and repair; and
- to support economic growth and empowerment through road-based transport infrastructure investment.

Branch Asset Management Objectives

The following asset management objectives were derived from the Branch's two strategic objectives:

1. Maintain road assets to ensure that the road is safe and smooth for private motorists, road-based public transport and commercial vehicles.
2. Optimise asset preservation over the long term.
3. Prioritise road asset investments that support economic growth.
4. Improve road asset performance to reduce agency and user costs.
5. Provide new asset capacity where demand exceeds capacity.

[1] "Effectiveness of road-based transport infrastructure" is an omission in this objective.

1.2.1 Relationship with other planning documents

This plan is mainly informed by the following documents:

- Strategic Plan 2019 to 2024, Department of Transport and Public Works, Provincial Government of the Western Cape
- Annual Performance Plan 2022/23, Department of Transport and Public Works, Provincial Government of the Western Cape

Furthermore, the intention of the Plan is to align provincial road asset management with government-wide strategic goals, which are outlined in the National Development Plan, the Medium Term Strategic Framework (MTSF), the Western Cape Provincial Strategic Plan and Spatial Development Framework, as well as the Provincial Land Transport Framework.

The RAMP is therefore aimed to align with The DTPW Outcome 1: A provincial infrastructure core that performs at its prescribed service delivery standards, and the MTSF 2: Economic Transformation and Job Creation. This plan gives effect to National Transport Sector Strategic Priority 3: Infrastructure Build That Grows the Economy. The RAMP is a key prerequisite for the realisation of the WCG's Vision Inspired Goals (VIP) 2: Growth and Jobs.

1.2.2 Key stakeholders of the RAMP

Good roads are essential for economic development and growth and it follows that all developmental agencies, private and public, are key stakeholders in this RAMP.

The Branch is committed to managing its road network on behalf of those who live, work and invest in the Western Cape, providing high-value services in a legally and environmentally compliant and sustainable manner, without compromising the health and safety of employees, service providers, contractors or customers. The key stakeholders in such a transactional environment would be those benefiting from a well-managed road network that meets desired standards and service levels, as well as those who would contribute to the integrity, sustainability and safe utilisation of the asset. Such stakeholders include:

- road users and commuters on the provincial road network, including private motorists, road-based public transport and commercial road users carrying freight, as well as pedestrians and cyclists;
- suppliers of essential services that have an impact on the road reserve, e.g., water, fuel lines, electricity, communications (collectively known as statutory service providers), who have equipment on and under the road that needs its own monitoring and maintenance;
- other transport suppliers, bus rapid transit, trains, buses and taxis, and non-motorised transport;
- SANRAL (South African National Roads Agency Ltd), that is responsible for most of the national roads that have an impact on the provincial road reserve;
- municipalities, including the five district municipalities which act as the agents of the Branch in the maintenance of certain roads, as well as all the other municipalities in the Western Cape and municipal structures such as the City of Cape Town transport authority Transport for Cape Town (TCT), who receive financial assistance for the maintenance and upgrading of certain roads;
- other government agencies with an interest in the employment-generating capacity of road maintenance and construction;
- Provincial Treasury which, through National Treasury, requested the compilation of this RAMP; and
- the National Department of Transport (NDOT) through its RAMP Guidelines issued under draft TMH 22: Road Asset Management Manual (Committee of Transport Officials, 2013).

1.3 RAMP framework

Introduction

The framework of this RAMP closely follows the recommendations in draft TMH 22 (Committee of Transport Officials, 2013). However, this could change once draft TMH 22 has been finalised. The current asset management maturity level practiced by the Branch is provided in the Appendix C – Gap Analysis.

Road network

This RAMP includes all road networks within the Western Cape that the Branch is accountable for. In addition, reference is made to SANRAL road networks that are also within the area of jurisdiction.

The road network of the Branch is represented by a GIS map (Appendix F – Maps of the road network) highlighting the roads that are under the jurisdiction of the Branch, as well as online at https://rnis.westerncape.gov.za.

Level of service

It is necessary to adopt appropriate levels of service and standards under the current budget constraints and asset conditions. These will need to be re-assessed in future with the objective of optimal management of road assets that is in alignment with the Branch's objectives and the Departmental vision.

A summary of levels of service and standards used in this RAMP is provided below. These levels of service and standards are from draft TMH 22 (Committee of Transport Officials, 2013). Where no standards are provided in draft TMH 22, the standards used are documented.

Situation analysis - current asset condition and performance

This section presents an analysis of the current situation pertaining to the Branch's road assets, comparing the actual conditions and service levels being provided against the minimum requirements documented in Chapter 3 of this RAMP.

Needs determination

Current needs

Road asset maintenance and rehabilitation needs are determined for current assets using a lifecycle benefit-cost analysis for an analysis period of 10 years, using appropriate maintenance treatments and network optimisation as required for Level 4 of the asset management maturity scale. The following budgets are covered:

- The Current Budget, providing the expected impacts on the road network of the current budget;
- An Optimised Budget that maximises the preservation of assets while minimising total transportation costs, providing the expected impacts derived from the optimum investment allocation per treatment category in comparison with the planned allocation of the current budget;
- A Technical Needs Budget determined by an analysis that has the objective of achieving immediate compliance with the levels of service as described Chapter 3; and
- An Intervention Budget determined by the desired level of service needs analysis, that provides the impacts and the optimum investment needs per treatment category to achieve the level of service as described Chapter 3 within a reasonable time period.

New assets

A Demand Management Plan (DMP) has not yet been compiled. The basis of demand determination is described given national road policies (i.e. RISFSA), as well as provincial and local strategic development plans that are likely to influence demand, such as economic and social strategies, spatial development initiatives, and land-use developments. A gap analysis that will identify backlogs in road infrastructure provision as well as accessibility to economic and social amenities will be included in future. In the interim, identified candidate new roads and upgrades, and infrastructure facilities to be planned for the next 10 years are provided here.

Asset management plans

The strategic analysis of this section supports the decision on the final budget most likely to be available for the next 10 years. The agreed multi-year optimised tactical plans based on this approved budget for the management of the road infrastructure assets are also included.

Financial summary

This section summarises the financial requirements that are discussed in Chapter 5 and Chapter 6 of the RAMP, together with the desired investment scenario.

Organisational support plan structure

Details of the Branch's capability to effectively execute the RAMP are provided in the plan.

Plan improvement and monitoring

The RAMP itself is guided by draft TMH 22 (Committee of Transport Officials, 2013). The key areas identified will be monitored to determine whether there has been an improvement.

Job creation and skills development

This section provides the number of jobs created during maintenance, repair and new construction of road assets over the previous years of the RAMP. Particular emphasis is placed on the use of the Provincial Road Maintenance Grant (PRMG) for labour-intensive construction methodologies, contractor development to optimise the job creation potential of routine road maintenance, upgrading, regravelling, black-top patching and limited rehabilitation works. Progress made on contractor development and the number of job opportunities created is included.

Analysis of strengths, weaknesses, opportunities, threats

The record of a comprehensive SWOT analysis is provided.

References

The list of documents used as source material for the development of the RAMP is provided.

Declarations

The Declaration of the RAMP is provided in Appendix B. The Branch is implementing within a Level II RAMS for the road and structure assets. This section also shows the completeness and the maximum age of data in each of the data sets.

1.4 The asset management approach to planning

The Branch applies best practice in infrastructure asset management.

1.4.1 Asset management defined

Asset management is defined by SANS ISO 55001:2015 (International Standards Organization for Standardization, 2015) as the "*coordinated activity of an organisation to realise value from assets*".

At the simplest level, it means an organisation is making the best decisions it can about its assets, based on a clear understanding of its long-term objectives and purpose (mission). Asset management is the discipline that seeks to achieve this.

1.4.2 Asset Management Framework

The aim of providing an Asset Management Framework is to provide a vision and best practice guideline for how asset management should be implemented in the Branch.

The IAM Conceptual Asset Management model

The IAM (Institute of Asset Management, 2015b) scope of asset management is shown in Figure 1-1 and includes the following:

- asset information;
- organisation and people;
- asset management decision-making;
- strategy and planning;
- lifecycle delivery, which includes the processes of acquisition, operation, maintenance and disposal of assets; and
- risk and review.

The significance of "asset information" and "organisation and people" as enablers for asset management is clearly shown in the diagram. These enablers are discussed further in Chapter 8.

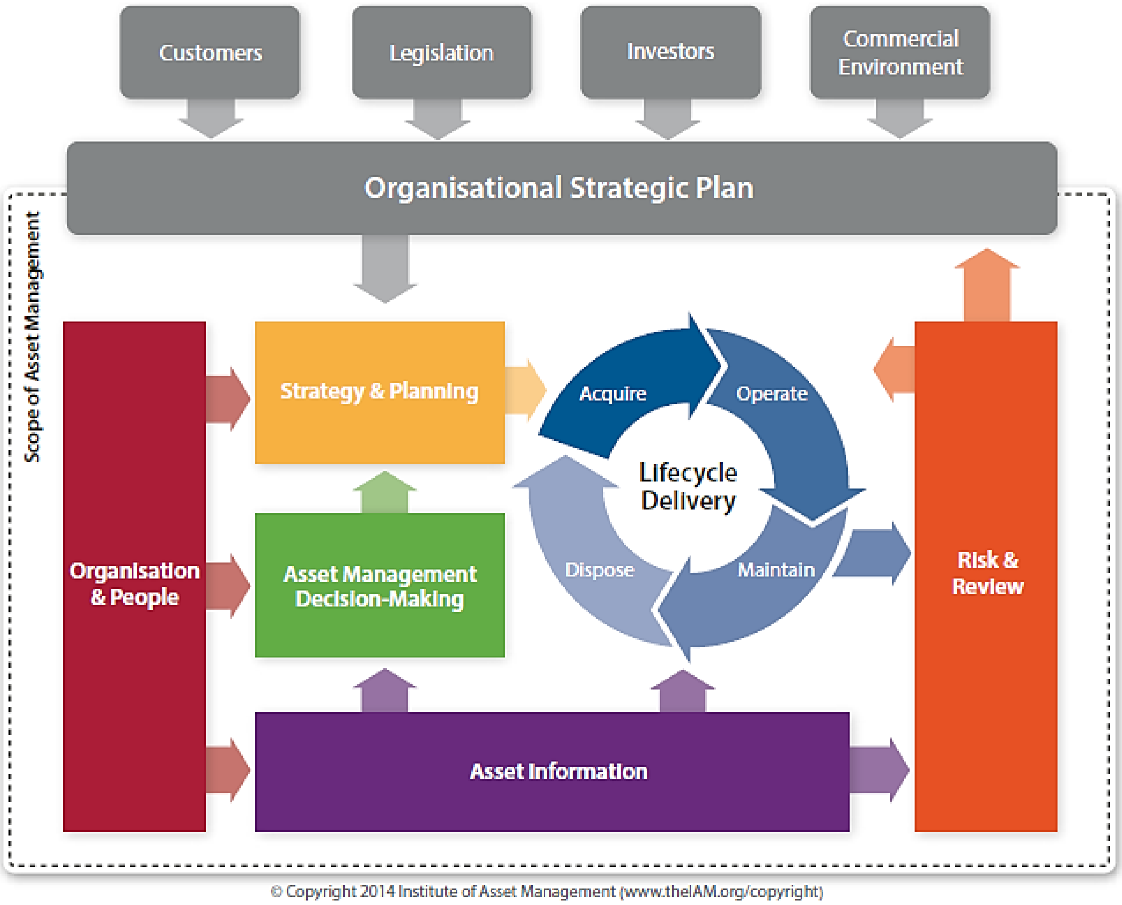


Figure 1-1: The IAM conceptual model of the scope of asset management

Guide to a Road System Manager for the Western Cape

A draft "Guide to a Road System Manager for the Western Cape" (Henderson, 2015) was written as a comprehensive guideline for best practice in asset management for provincial road networks. The guide draws on many documents and standards, including:

- Guide to Asset Management, Austroads, Australia (Austroads, 2009);
- The Interim Guide to the RSM Framework within Transport and Main Roads, Queensland Department, 2010 (TMR, 2010);
- Transportation Asset Management Guide, American Association of State Highway and Transportation Officials, 2002. (AASHTO, 2002);
- SANS 55001:2015: Asset management, International Standards Organisation, 2014 (International Standards Organization for Standardization, 2015); and
- Asset Management – an anatomy Version 2. The Institute of Asset Management, UK, 2015 (Institute of Asset Management, 2015b).

The essence of the guide is described by the business framework shown in Figure 1-2. At the heart of the business processes lie the seven phases with their feedback loops.

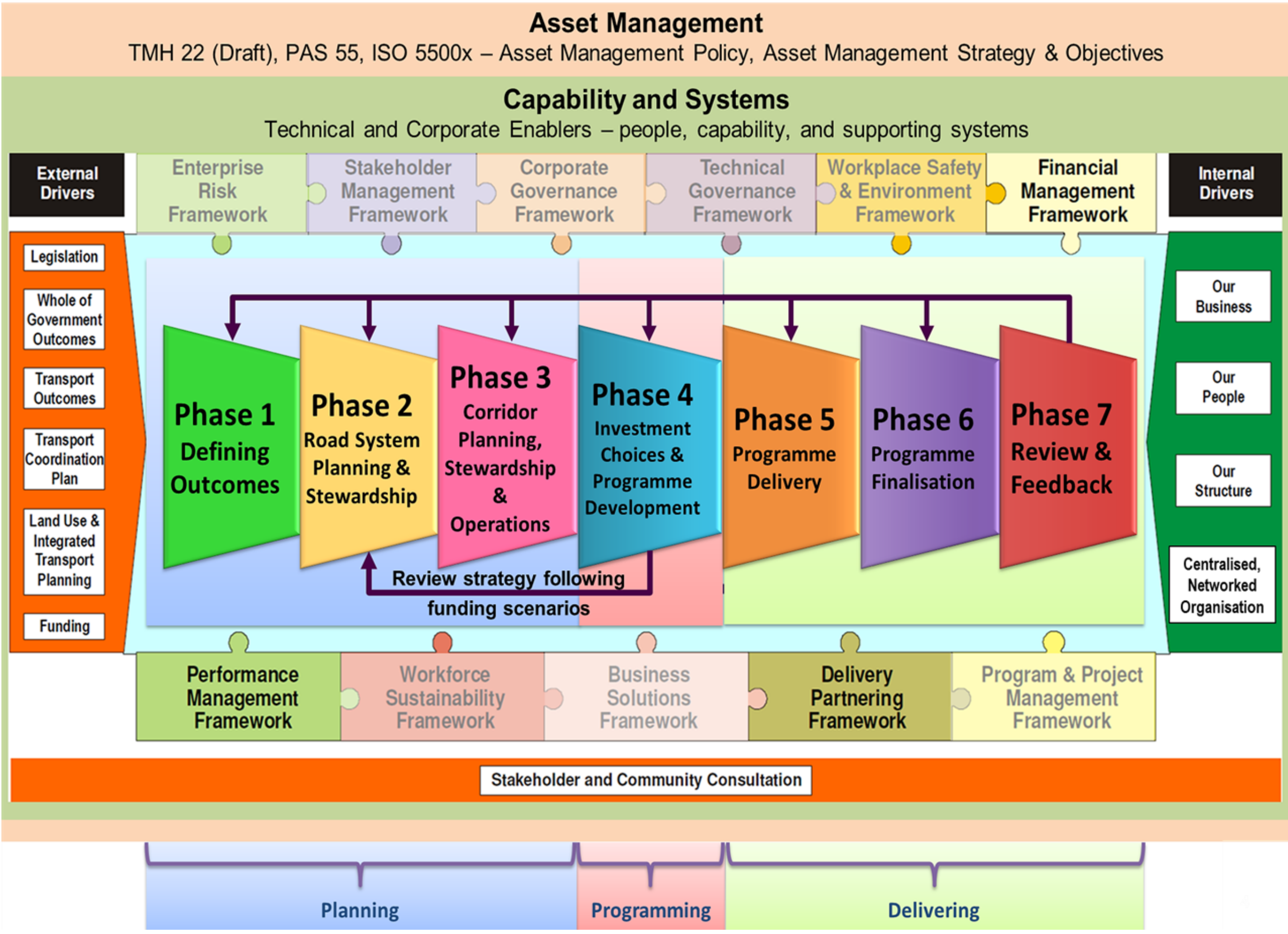


Figure 1-2: Proposed business framework for the Branch

1.4.3 Developing the Branch Asset Management Policy

The implementation of the Branch's Strategic Plan for its road assets relies on a planning approach and methodology that is grounded in asset management policy, strategies and plans. The Asset Management Policy is the link between the Organisational Plan of an organisation and its Asset Management Strategy. It is typically a set of principles or guidelines to steer asset management activity towards achieving the organisation's objectives. It specifically covers the "what" needs to be done and the "why" it needs to be done. The Branch's Asset Management Policy is included as Appendix A – Road Asset Management Policy.

1.4.4 Developing asset management strategies

Background

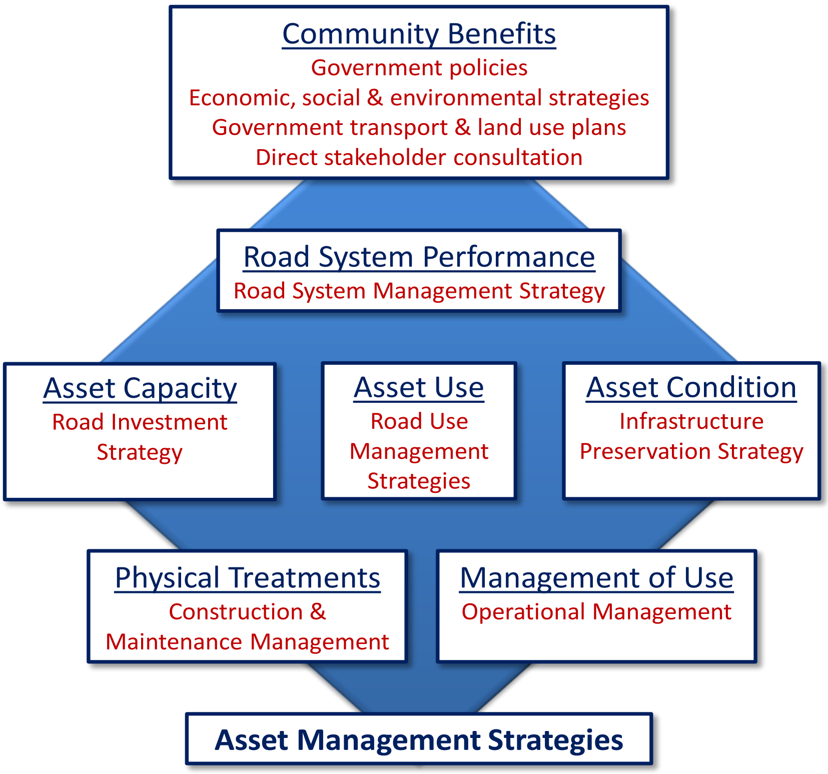
Asset management strategies direct an organisation's asset management activity. It will determine the **high-level asset management objectives** that are needed from the activity to deliver the organisation's objectives and it will define the approach to planning that will be taken.

As part of the total asset management task, it is useful to develop separate but integrated strategies (Austroads, 2009) that focus on:

- road system performance;
- capital investment;
- road infrastructure preservation; and
- road use.

This approach is based on a hierarchy of road asset management strategies, as shown in Figure 1-3. The figure illustrates the key elements of asset management for road networks. All elements are interrelated. The blue, solid background is a representation of such relationships which, if shown, would appear as an extremely complex diagram. Although only the preservation strategy, described in this RAMP, and some road-use strategies currently exist, the synthesis of a road system management strategy and a road investment strategy is envisaged in the future. These will provide the complete framework for managing the road network. A description of these documents follows:

- Roads System Management Strategy;
- Road Investment Strategy;
- Road Use Management Strategy; and
- Infrastructure Preservation Strategy.



©Austroads (Austroads, 2009)

Figure 1-3: Hierarchy of road asset management strategies

Envisaged Road System Management Strategy

The envisaged Road System Management Strategy (RSMS) will examine the community needs and expectations for the performance of all assets comprising the road system. The focus of the RSMS is to establish an over-arching hierarchy of performance-based levels of service and future vision of fit-for-purpose standards for the configuration, capacity, use and condition of the various road network assets (Austroads, 2009). These levels of service reflect the strategic function and level of use of different routes in the road network to achieve the desired performance. The envisaged RSMS will set the direction of asset management for many decades to come. The road system management strategy is a strategic document that will demonstrate the relationship between the directions of development of the road system and the community's directions of economic development, social development and environmental management. The latter are commonly presented in government policies, strategies and plans, supplemented by direct community consultation.

The RSMS will also demonstrate to government and key stakeholders the synergies of targeted investments in the management and development of the road system together with other initiatives to achieve government policy outcomes. Furthermore, the RSMS will present the rationale behind fit-for-purpose performance targets and corresponding standards for the capacity, condition and use of various components of the road system (Austroads, 2009).

Until such time that the strategy has been compiled, reference is made to the various government Acts and policies, as well as Branch policies for the identification, planning and design of projects.

Envisaged Roads Investment Strategy

The envisaged Road Investment Strategy (RIS) translates road system performance objectives, driven by community outcomes, into priorities for investments in road system capacity. The RIS will identify and prioritise capital investments in the road system that will progressively achieve the target network configuration and capacity identified in the RSMS, while recognising forecast patterns of road use demand and funding availability. The envisaged RIS articulates the priorities and effectiveness of capital investments in improving the capacity of the road system.

The RIS will be used for the guidance of planners, project designers and developers of road investment proposals (Austroads, 2009).

Infrastructure Preservation Strategy

The Infrastructure Preservation Strategy (IPS) provides the strategic framework for managing the condition of the road network by translating road system performance objectives into preservation treatment priorities, as illustrated and outlined in Figure 1-4. This is achieved by a technique known as lifecycle value realisation (LVR) and includes:

- forecasting patterns of deterioration of asset condition;
- the effects of treatment programmes on lifecycle costs of the asset; and
- the effect of asset condition on road user costs, ride quality and safety.

It enables the development of sustainable maintenance and the renewal programmes to achieve and maintain the asset condition objectives in terms of levels of service and target standards developed in the Road Use Management Strategy (RUMS). The IPS guides the branch in terms of maintenance management for the road network.

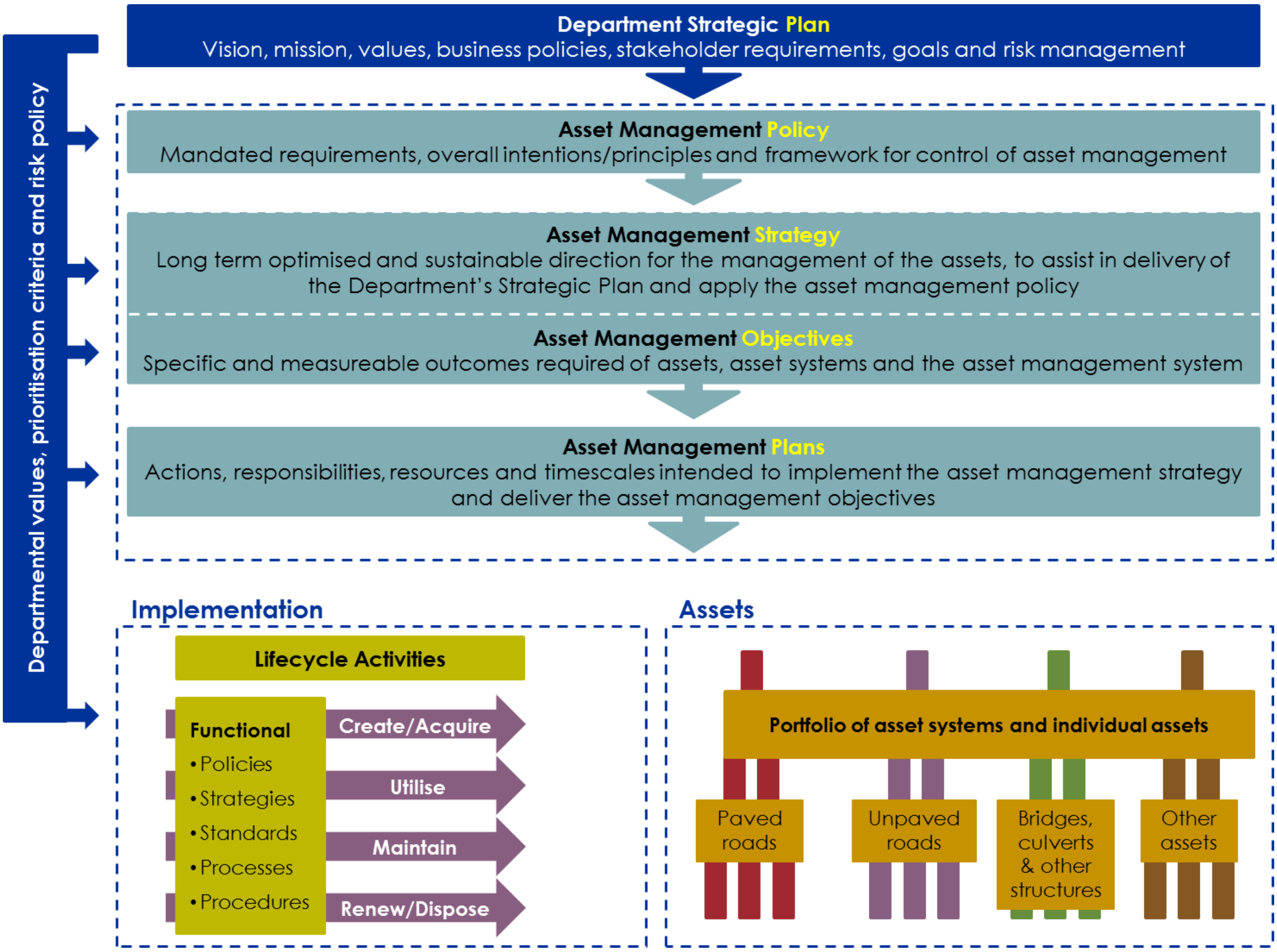
This RAMP supersedes the Road Preservation Report that previously provided the Infrastructure Preservation Strategy.

Lifecycle value realisation

LVR covers all the activities undertaken by the Branch to establish the desired balance for the costs and benefits of different interventions for the maintenance, renewal and disposal of road assets. In practice, this is a combination of capital investment decision-making and operations and maintenance decision-making techniques to optimise the value obtained from assets (Institute of Asset Management, 2015c). LVR requires the optimisation of both lifecycle costs in comparison with the value obtained from assets over the organisation's period of responsibility.

To achieve this outcome, it is necessary to apply both lifecycle costing (LC) and value optimisation (VO) techniques. If a required asset performance is met, then the lowest LC corresponds to the best-value method of delivering this requirement for the organisation. Sometimes LC is called "total cost of ownership". VO considers the value of the asset system in addition to the asset cost. It aims to deliver the best ratio of benefits (in terms of delivering organisational strategic goals) and LC; in other words, the best value-for-money.

The typical applications of LC and VO in the Branch at different levels of managing assets are illustrated in Figure 1-5.



©Institute of Asset Management

Figure 1-4: Planning and implementation elements of an asset management system

LC and VO are applied at three levels, namely, portfolio, system and asset, as described below.

Portfolio-level application of LC and VO

The Branch has a large portfolio of assets and asset systems within its control (i.e. paved roads, unpaved roads, bridges, culverts, retaining walls, signage, fences, weighbridges, etc.), all of which present competing demands on scarce resources. Therefore, it is essential to analyse the costs, capabilities, and risks within the entire portfolio of assets to produce a refined suite of plans and deliverables. The current implementation of this approach in the Branch is comprehensive for the paved and unpaved roads only, but is limited for other asset types, such as bridges, culverts, etc.

System-level application of LC and VO

When value is being created at the system level, i.e. the paved and unpaved road networks, it is necessary to evaluate and optimise performance, delivery, cost and risk across the assets in the system from the top down. System-wide LC, risks and performance are estimated by aggregating the impact of all assets by modelling the capability of the system holistically. The current implementation of this approach is comprehensive for the paved and managed unpaved roads only.

Asset-level application of LC and VO

Where optimisation of capital investment decision-making and operations and maintenance decision-making for an individual asset is carried out, asset-level decisions need to consider the asset's contribution at the system level. The current implementation of this approach in the Branch is comprehensive for the paved and managed unpaved roads, but is limited for bridges, culverts and the other assets.

The concept of the differing levels of application of LC and VO is illustrated in Figure 1-5.

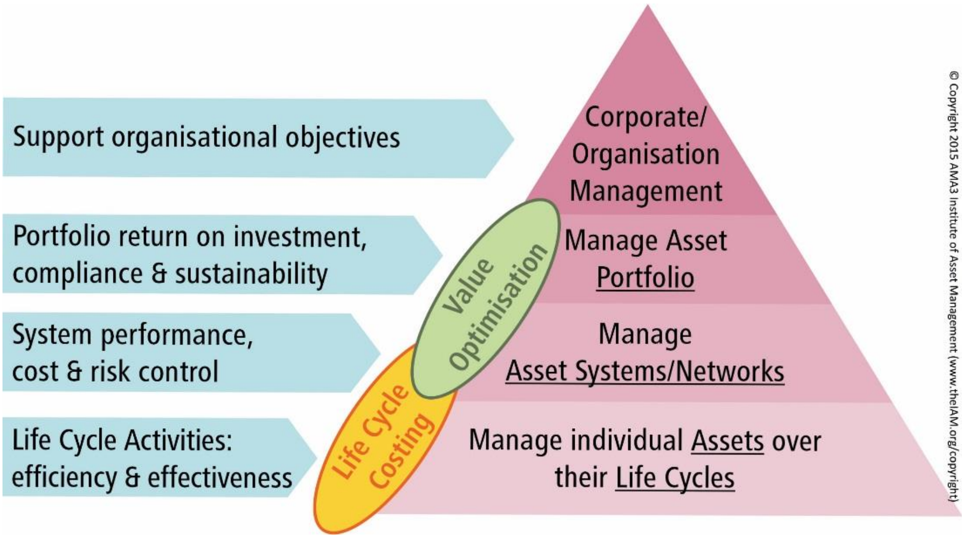


Figure 1-5: LC and VO at different levels of managing assets

LC and VO combine capital investment decision-making with operations and maintenance decision-making processes to support asset management decisions. These decisions are made in relation to costs, risks and value opportunities, taking account of both the immediate/short term impacts and any longer-term consequences. The correct application of LC and VO can produce:

- increased financial and economic benefits;
- improved decision-making effectiveness;
- better communication with stakeholders; and
- improved cross-disciplinary governance and consistency.

LC and VO help to ensure that the right decisions are made about:

- what to do;
- how much to spend;
- on what assets; and
- when to do it.

Further details on the benefits of LC and VO are documented in Life Cycle Value Realisation (Institute of Asset Management, 2015c).

Preserving pavement assets

It is important to understand the implications of the two alternative strategies (maintenance strategy and renewal (rehabilitation) strategy) for preserving road pavement assets, which are based on the characteristic lifecycle of roads.

Figure 1-6 shows the effect of these two strategies represented by the blue line (renewal) and the green, broken line (maintenance). Road roughness is used as the measure of the performance of the pavement. Road roughness, or roughness, is the term used to describe the relative degree of comfort or discomfort experienced by a road user when using a road. The International Roughness Index (IRI) is a roughness parameter which is determined from the longitudinal road profile measured in a wheel path. In the IRI calculation, the measured profile is processed using a mathematical transformation which filters and cumulates the wavelengths encountered in the profile. This transformation was developed and calibrated in a manner that ensures that the output, i.e. the IRI, is closely correlated with road user perception of roughness and tyre load dynamics, which impact on vehicle control and safety (Committee of Transport Officials, 2016). Roughness is measured on a regular basis by the Branch. More details on this topic can be found in Chapter 3 – Level of Service.

When a road becomes rough to ride on, users experience a ride that is bumpy and potentially unsafe. Roughness is also an indicator of the condition of the underlying pavement structure layers.

Maintenance strategy

This strategy assumes adequate funding for routine maintenance, reseal and rehabilitation. Figure 1-6 illustrates the deterioration of roughness with time and shows the required maintenance treatments of:

- routine maintenance;
- resealing at appropriate intervals; and
- rehabilitation once the riding quality (road roughness) and condition of the road has deteriorated to the intervention level.

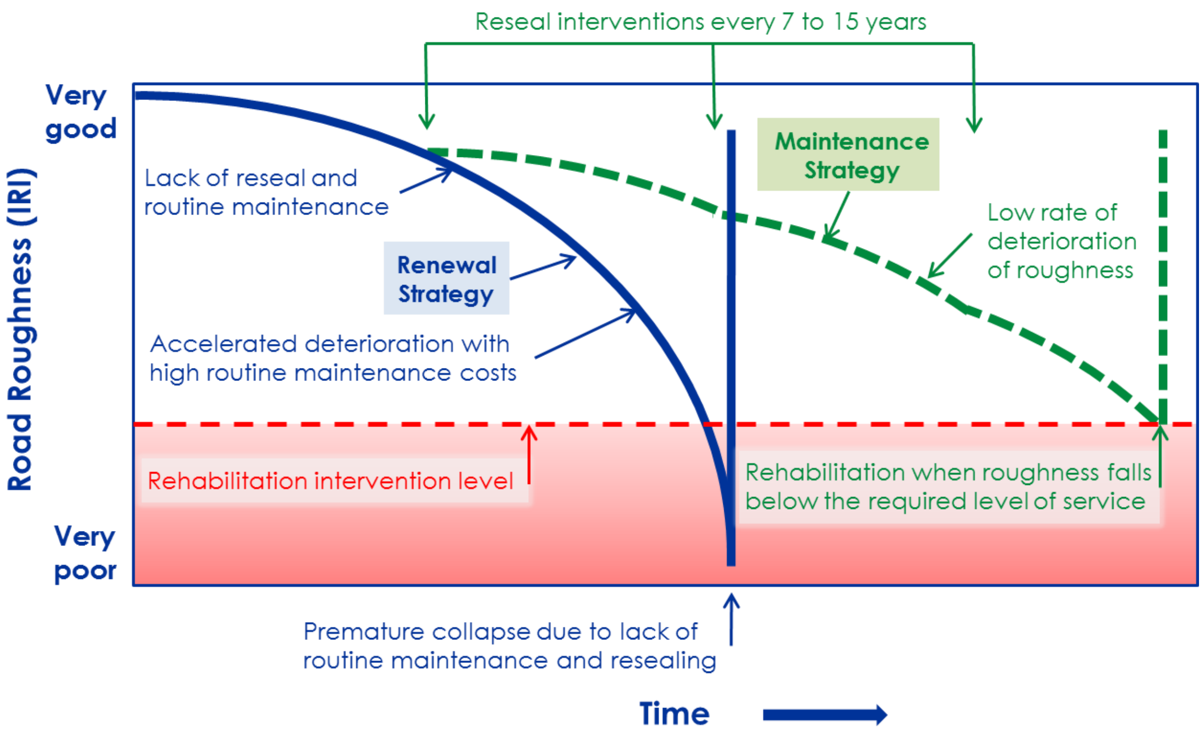


Figure 1-6: Characteristic graph of deteriorating roughness showing the effect of different strategies

The implementation of the maintenance strategy retards the deterioration of the road network by protecting the roads from ingress of water and thereby maximises the useful life of the road until it finally requires rehabilitation. The maintenance strategy results in the lowest costs to the road user and the Branch and the network is preserved in a condition that functions optimally.

The Branch has adopted the Maintenance Strategy for the Preservation of the provincial Road Network in the Western Cape

Renewal strategy

This strategy assumes insufficient funds for routine maintenance and resealing and a fix-worst-first approach is followed for the selection of maintenance options:

- there is a high demand on routine maintenance to prevent the collapse of the road surface, and the consequence is escalating routine maintenance costs;
- severely deteriorated roads require premature rehabilitation due to insufficient preventive maintenance at a cost of at least ten times more than the cost of resealing; and
- the renewal strategy leads to destruction of the road asset, which is very expensive to replace because of the premium paid for rehabilitation or reconstruction. The road user pays excessive costs due to the poor condition of the provincial road network and the Branch pays extra for the intervention.

The renewal strategy is neither desirable nor sustainable. Once the network deteriorates beyond the point where the maintenance strategy can no longer be applied because of accelerating deterioration, the renewal strategy takes over and the accelerating destruction of asset is inevitable without an injection of additional funds.

Road use management strategies

The road system cannot accommodate unconstrained use. To address this, road use management strategies (RUMS) provide a framework for the management of road use, particularly for specific road user groups, such as freight vehicles, public transport, port access, and mining-related cartage. Such operational management strategies are complementary to the Road Investment Strategy and the Infrastructure Preservation Strategy.

The RUMS also provides a strategic framework to manage the use of the road system, including vehicle registration, mass and dimension limits, operational requirements, licensing of drivers and operators, traffic management, and road space allocation (Austroads, 2009).

RUMS typically includes:

- Road Access Guideline supported by the Access Management Guidelines;
- Designated routes for heavy or oversize vehicles;
- Abnormal loads;
- Speed management; and
- Priority lanes for public transport vehicle movements.

Travel demand management (TDM) strategies that focus on managing the level of travel demand and influencing modal choice are a sub-set of road use management strategies.

1.5 Asset information systems

According to the IAM (Institute of Asset Management, 2015a), "*Organisations should establish and maintain systems that manage asset information. The systems should be designed to provide sufficient support and information to meet the organisation's asset management objectives*". Furthermore, the IAM goes on to say that "*Unless the content of the asset information system is managed appropriately then the business decision making capability will be impaired*".

Examples of this impairment are when:

- Maintaining assets;
- Setting investment requirements/ capital expenditure planning;
- Responding to alarms and operational incidents; and

- Managing logistics.

The IAM concludes that "*Having an effective asset information management system is a key component of asset management. Such a system ensures that the right information is available to the right users at the right time to support business objectives*" (Institute of Asset Management, 2015a).

1.5.1 Value of asset information

Cost efficiencies

The IAM (Institute of Asset Management, 2015a) quotes studies that have shown that asset information has a very significant effect on the efficiency and performance of asset-intensive businesses. Organisations operating efficient asset information processes have been found to spend around 20% of their total annual budget (OPEX and CAPEX) on asset information. In businesses with poor asset information processes, this can increase to as much as 25%. Therefore, improving the efficiency of how asset information is managed within the business therefore offers a significant opportunity for savings.

Expenditure effectiveness

The IAM (Institute of Asset Management, 2015a)advises that an even greater benefit can be realised if asset information is used effectively to inform decision making on business expenditure profiles, such as capital programmes to improve asset serviceability, or best whole-life cost decisions regarding maintenance and renewal choices, i.e., the appropriate use of asset information will **enable the right work to be done in the right place at the right time**.

1.5.2 Asset Information Management System

The IAM (Institute of Asset Management, 2015a) recommends that an Asset Information Management System (AIMS) be established to define and manage the use of asset information as a key component, and in support of, the Asset Management System. AIMS will be a core part of the operation of the Branch, will receive suitable high-level input and support and will be reviewed on a periodic basis to maintain alignment with Branch objectives and the Asset Management System. The AIMS is shown in Figure 1-7 (Institute of Asset Management, 2015a). The word "governance" in this context refers to the disciplines involved in managing and controlling data and information.

As can be seen in Figure 1-7, the AIMS will consider the following:

- Asset Information Strategy;
- Standards, specifications and requirements for asset information;
- Managing information through its lifecycle;
- Monitoring, auditing and benchmarking to review performance;
- Ongoing consideration of governance, people and organisational factors;
- Management of processes and systems; and
- Effective management of change

In this context, the new Chief Directorate Road Programme Management developed within the roads branch as from April 2020, will need to assess how "good practice" approaches may be relevant to the Branch objectives.

1.6 Road Asset Management Systems

Asset information is a key enabler for effective asset management (Institute of Asset Management, 2015a). The Branch relies heavily on its Road Asset Management System and supporting processes to enable effective and efficient asset management. In terms of SANS 55001:2015 (International Standards Organization for Standardization, 2015), this includes project identification, optimisation of projects and programmes, programme and project management.

The creation and ongoing development of road information management systems has a long history in the Branch. The historical context of these developments is described below.

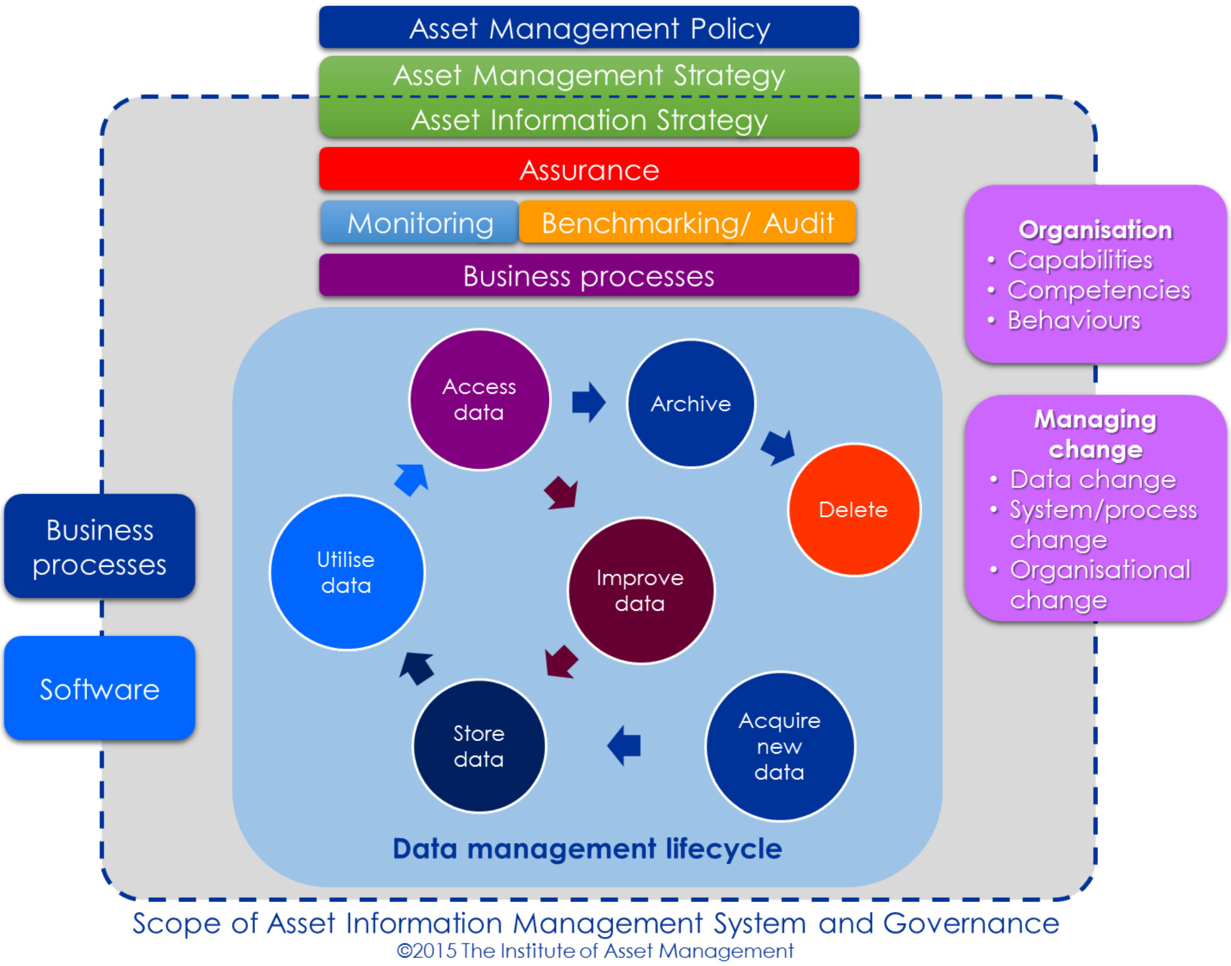


Figure 1-7: The asset information management system

1.6.1 Historical development of road management systems

In 1980 what was then the Department of Roads of the Cape Provincial Administration recognised the need to develop formal procedures that use objective data on which to base maintenance strategy and policy, and to identify and prioritise rehabilitation and resealing projects. This strategic approach to asset management has been defined and refined in the preservation strategy of the Branch over more than 30 years.

The Pavement Management System (PMS) was initiated in 1981 with the help of the Council for Scientific and Industrial Research (CSIR) and was developed and enhanced in-house with the assistance of consulting engineers. The PMS supports strategic-level decisions. It provides a repository of as-built pavement structure information. Condition reports can be obtained from the PMS that include both functional and structural condition. The system is used to identify candidate resealing projects and develop a list of resealing priorities.

The Gravel Roads Management System (GRMS) was initiated in 1989 to expand the scope of the PMS to include unpaved (gravel) roads. A panel of consulting engineers was appointed to assist with the implementation and the management of this new system. The GRMS supports strategic- and tactical-level decisions. The GRMS provides a repository of gravel-wearing course information and visual survey and dynamic core penetrometer (DCP) data. Condition reports can be obtained from the GRMS that provide functional condition. The system is used to identify and priorities candidate regravelling projects as well as special maintenance projects, such as spot regravelling.

The latest phase of the development of the PMS and GRMS was being upgraded to web-enabled systems. There are ongoing improvements to the systems and the technology used for data collection.

In 1995, the Branch contracted Aurecon to use the Deighton Total Infrastructure Management System (dTIMS) with the data from the PMS and GRMS databases to provide powerful functionality, enabling lifecycle cost-benefit analysis to be used in the optimisation process for projects under constrained budget conditions.

The priority of rehabilitation and upgrade projects is determined by means of an optimisation process using incremental benefit-cost analysis. The objective function (refer to paragraph 5.1.13, Background to the lifecycle benefit-cost analysis) initially used was to minimise total transport costs (TTC). These costs were calculated from vehicle operating costs and agency costs. This TTC objective function was subsequently modified in 2009 to allow for asset preservation on low-traffic roads by maximising road condition.

The World Bank Highway Development and Management system HDM-4 models are calibrated for the Western Cape using data from 37 monitored sections of road throughout the province captured over the last 15 years. These models predict the future deterioration of the road network and provide information for estimating vehicle operating costs. dTIMS enables the combined analysis of both paved and unpaved roads to produce the optimum distribution of funds, thus guiding the Branch in the most effective allocation of resources.

The following kinds of potential projects are identified by dTIMS:

- Rehabilitation/ reconstruction;
- Light rehabilitation;
- Resealing;
- Regravelling; and
- Upgrading to paved standards.

dTIMS determines the technical budget needs and the optimised MTEF budgets for each project type listed above. This improves the allocation of funding sources to identified areas of need.

The Bridge and Structures Management System, known as STRUMAN, was developed by the CSIR and initiated in 1998. It provides an inventory of bridges and large culverts. Needs are determined from *ad hoc* visual inspections. Currently, no algorithms are being used to determine maintenance needs.

It is envisaged that in future dTIMS or similar approved industry software will include functionality for determining the maintenance priorities for structures.

The Traffic Counting System (TCS) was developed more than 50 years ago and continues to be refined and upgraded. The system provides reliable traffic counts for the PMS and dTIMS to support the demand analysis.

The first phase of a new system called the Gravel Roads Maintenance Management System (GROMAMAS) was implemented in 2005. GROMAMAS manages all the processes associated with the regravelling and maintenance of unpaved roads. The GROMAMAS supports tactical and operational decisions.

In 2008 the borrow pit module in the Gravel Management System was split off to create the Materials Information Management System (MIMS). This system is currently a repository of information on all borrow pits used for the maintenance of unpaved roads. MIMS will, in future, provide valuable information on the availability and spatial distribution of gravel materials. MIMS is operational and is currently being enhanced.

The major technical systems architecture is shown diagrammatically in Figure 1-8 and places the systems with respect to their support of strategic, tactical and operational levels of decision making. Systems shown in grey are not operational and are envisaged or under development. The acronyms used in Figure 1-8 are described in the list of acronyms at the beginning of the RAMP. The purpose and output of the Strategic Asset Management Systems is listed in Appendix D. Similarly, systems of a tactical and operational nature are listed in Appendix E.

1.6.2 Outline of the asset management information available

All surveillance data (listed in Table 3-1, Table 3-2 and Table 3-5) is available from the systems described in Annexure D and E. Comprehensive reports are prepared annually on the state of the paved and unpaved road network that cover the condition of each road.

1.6.3 Gap analysis for RAMS

All systems are reviewed periodically, and their functionality updated to meet the information requirements of the Branch. Systems are also redeveloped to keep up with changes in technology. Currently, gaps in systems and processes are identified by system owners and these are attended to depending on priority and funding. The Department has an Information Technology Steering Committee to guide and direct systems developments within the department. In addition, the Branch committee member works towards a gap assessment of information management and processes in terms of best practice contained in SANS 55001:2015 (International Standards Organization for Standardization, 2015), PAS 55 (British Standards Institute, 2008), the IAM publication "Asset Information, Strategy, Standards and Data Management" (Institute of Asset Management, 2015a) and Asset Management – an anatomy (Institute of Asset Management, 2015b).

The following gaps have been identified:

- The lack of an information system to support the management of routine maintenance of the paved road network will be ameliorated by the implementation of a Maintenance Management System, call Regional Operations Planning and Execution (ROPE).
- The lack of control over how project estimates are prepared and the lack of a formal system to provide unit rates for strategic, tactical and operations planning will be ameliorated by the implementation of an Estimating and Unit Rate System (EURS).

1.6.4 Evaluation of information and analysis functions

The American Association of State Highway and Transportation Officials (AASHTO) self-assessment questionnaire (AASHTO, 2002) was used as a tool to evaluate the state of asset management in the Branch as at 10 July 2015, and reported on in the RAMP 2017/18 to 2026/27.

The Branch has initiated an independent evaluation of the efficiency of available systems and processes in September 2018. This exercise will form part of the System Support Services review of key asset management systems and the development of a new efficiency process system.

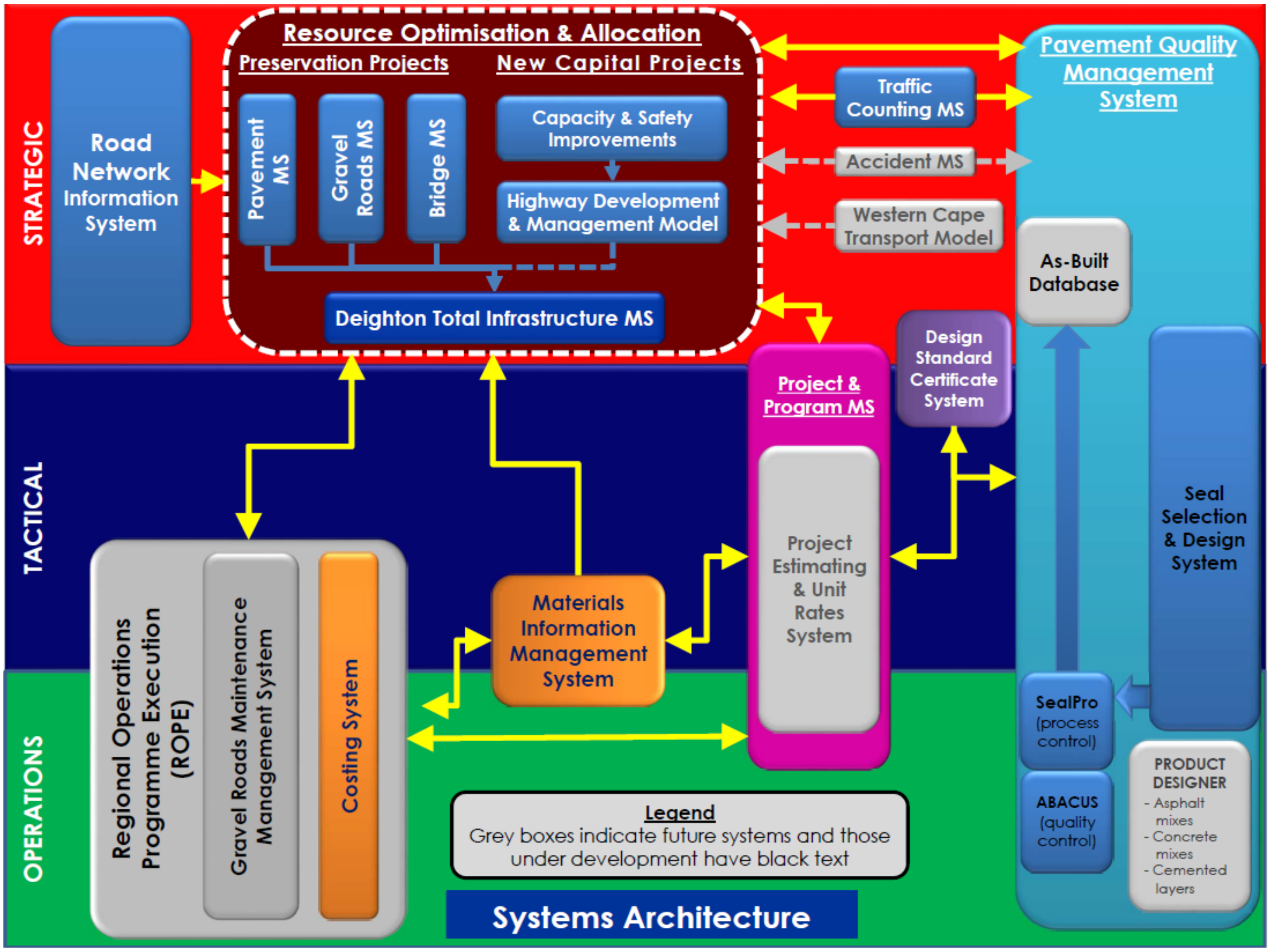


Figure 1-8: Major systems architecture

1.6.5 Driving Technology in the Workplace

It is nothing new to any reader that during the year of 2020 the COVID-19 global pandemic changed the way we work. As the SARS-Cov-2 virus hit the shores of countries around the world it forced a change in the way we move, communicate and share. However, even before this, the workforce started moving toward a work environment which challenged the fundamentals of our traditional working day.

Consequently, it is becoming increasingly necessary to re-evaluate our working day and whether we are effectively leveraging the benefits which technology has to offer. In a new age of working, the Roads Branch is evaluating their current means of working by assessing existing systems, system efficiency and relevance. The consideration of alternative forms of technology strategies and uptake will be a key driver to necessary technology changes in the workplace.

The Roads Branch identified a few areas where technology will streamline project delivery:

Digital transformation

The Branch is currently evaluating existing system efficiency to ensure timeous and effective project delivery. This movement is in the initial stages of development and is encapsulated under the codename "*Robinson*". The name is derived from Heath Robinson, a British Cartoonist known for his comical drawings of ridiculously complicated machines designed to achieved simple objectives. Robinson is an efficiency system which is based on the principles of system engineering and will assist the Branch to seamlessly comply with the requirements of National Treasury's Infrastructure Delivery Management System (IDMS). It aims to integrate Branch activities in a systematic manner through digitized project stages, gateway approvals and other financial and reporting requirements.

Digital engineering through BIM

Building Information Modelling (BIM) is an intelligent 3D model-based project development process that gives planning, engineering, and construction professionals the insight and tools to more efficiently plan, design, construct, and manage built infrastructure. It enables document management, coordination and simulation during the entire lifecycle of a project.

The Roads Branch is currently using paper-based approval processes during its various project development stages. Several of the consulting engineers which assist the Branch with project delivery are adopting BIM practices in its design processes. This provides an opportune environment to develop the Branch's capacity and knowledge in the field of BIM. The BIM design philosophy should be encouraged in project delivery and ultimately move the Branch toward more efficient processes. Figure 1-9 shows an example of 3D modelling and the potential to effectively integrate processes and lead to improved and cost-effective efficiency.

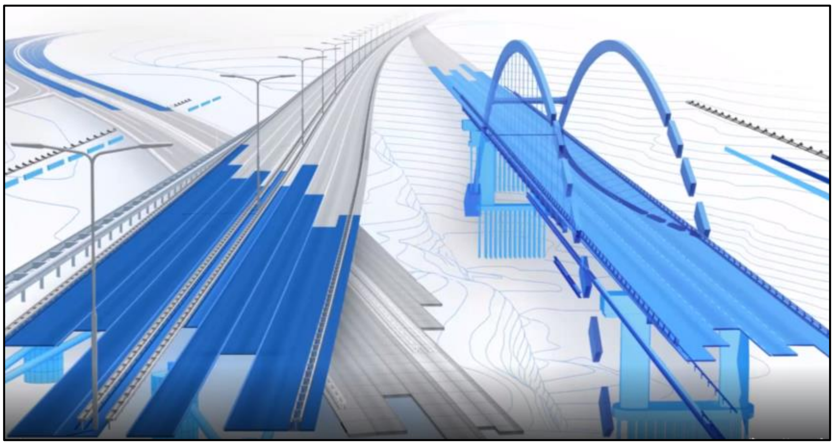


Figure 1-9: 3D modelling (Autodesk, 2020)

2D drawings and models remain a requirement for many clients, including the Roads Branch. In a stage where digital transformation strategies are developed, client authorities can leverage the BIM capabilities through seamless 3D to 2D transitioning as shown in Figure 1-10. This means client authorities can still adhere to their current design approval requirements while simultaneously leveraging the benefits of 3D modelling during project development.

Significant progress has been made to transition from a paper-based report submission system to electronic submissions, however, more focus should be directed to the 3D model-based design-based philosophy. This is not a simple process and involves people and working culture, technology systems, new processes and a revisit to the relationship between client teams and delivery teams.

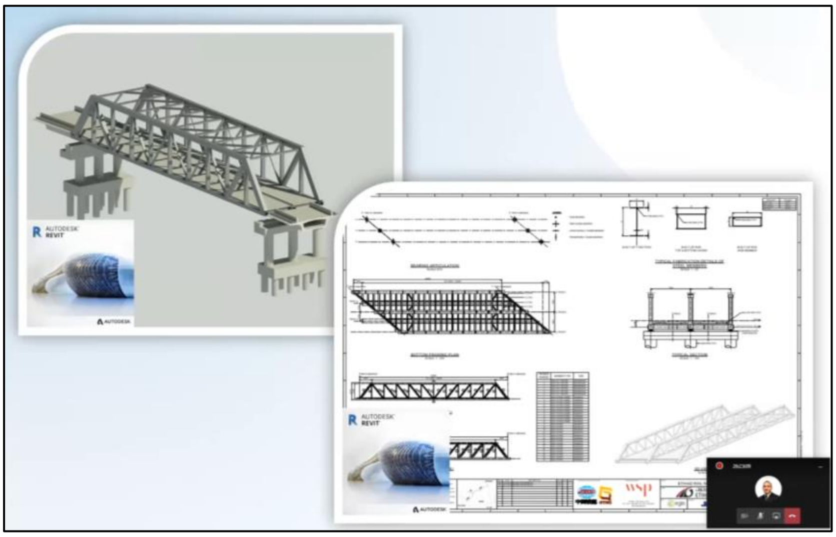


Figure 1-10: Seamless integration between 3D and 2D models are possible to aid the digital transformation process. (WSP Digital Engineering webinar, 2020)

Integration between hardware and software

The successful transformation to a modern workplace is not possible without digital technologies and devices. The well-planned integration between these two are critical to gain the most out of each.

Staff need basic equipment in terms of digital devices and technologies – laptops, tablets and smartphones, along with secure external access to relevant company data, information and processes. This is essential in order to work independently of a specific location. It is a growing opinion that any space and location strategy that does not include the availability of such basic equipment is not likely to succeed.

Second, staff also need additional tools and software that promote collaboration. The main issue here is how virtual teams can best collaborate. Tools such as chat functions, document management systems and video conferencing are crucial and are also becoming increasingly user-friendly and suitable for mobile working. However, it is essential to set out clear rules for how such tools are used. At team level, for example, guidance should specify which tools (chat, email and/or video conferencing) should be used for which types of communication – and how they should be used.

Connectivity Readiness

Business demands and connectivity infrastructures are changing. Connectivity and network infrastructure have become a vital part of most of the Branch's operations, making it a fundamental element required for the necessary level of production.

As the organisation's technology strategy is moving toward processes which require higher data usage, it is vital to plan for investment in connectivity infrastructure which will enable the processing of high volumes of data. The stability of the network and the availability of Wi-Fi hotspots needs to be assessed for appropriateness. Personal data allocations must be re-evaluated to determine whether it is sufficient for the required work.

1.7 Administrative and financial management

In addition to RAMS, other support systems can be classified into the categories of administrative and financial management systems.

1.7.1 Administrative and Financial systems

The following is a list of systems in use by the Branch:

- Outlook;
- Integrated loss control system;
- Supplier Invoice Tracking Systems (SITS)
- Basic Accounting System (BAS);
- Personnel and salary administration system (PERSAL);
- Strategic planning monitoring system;
- Integrated Procurement System (IPS); and
- Electronic Content Management document management system (ECM).

1.7.2 Financial management services

Financial management services are rendered to the Branch by the Financial Management Branch of the Department. The Financial Management Branch consists of the following divisions:

- Management Accounting;
- Financial Accounting, Financial Control; and
- Supply Chain Management.

The Branch uses the transversal National Treasury financial management systems. In addition to these systems, the Department is using various debtors and management reporting systems to improve financial and budgetary controls.

The financial management of the Branch is structured on a decentralised basis and management in the various components of the Branch is financially accountable. Systems have been developed to complement this decentralised strategy. The Financial Management Branch holds regular meetings with the management of the Branch and key financial staff to ensure effective and efficient control.

The Branch regards compliance with the Public Finance Management Act (PFMA) (Act 1 of 1999) as a high priority. The Branch completes the National Treasury’s normative measures report on a quarterly basis and submits the report to Provincial Treasury.

No changes in the financial management services and systems are required by this RAMP.

Chapter 2 – The Road Network

2.1 Ownership of the road infrastructure

The Constitution of the Republic of South Africa, 1996, lists provincial roads and traffic management as a Schedule 5, Part A function, which is an exclusive provincial legislative competence, but does not give a specific definition of provincial roads. Nor do the Local Government: Municipal Structures Act (Act 32 of 2000) or the Local Government: Municipal Systems Act (Act 117 of 1998) define roads and streets. The division of functions between the provincial and local spheres of government remains unstructured and guided by historic arrangements and informal agreements entered into in the spirit of co-operative governance.

Section 7(1) of the Cape Roads Ordinance requires that the "Administrator" shall undertake the construction and maintenance of every public road, other than a minor road of which the "Administrator" is the road authority. Section 7(2) requires that a "(Divisional) Council' shall, in so far as funds permit, undertake the construction and maintenance of every divisional road of which the Council is the road authority". Section 7(3) states that the road authority "may undertake the construction and maintenance of every minor road and public path of which it is the road authority".

Prior to the establishment of regional services councils during the period 1987 to 1989, the divisional councils were the road authorities for proclaimed main roads, divisional roads, minor roads and public paths in rural areas and in outer municipal areas. Divisional councils were abolished in the late 1980s. During 1992, all assets, liabilities, rights, duties and obligations of the regional services councils in respect of proclaimed main roads, divisional roads, minor roads and public paths were passed to the then Administrator of the Cape of Good Hope. This resulted in the Provincial Government of the Western Cape becoming the road authority for all provincially proclaimed roads in the province. This "road authority" function has been delegated to the Minister responsible for the Department of Transport and Public Works, with the Provincial Roads Branch of the Department of Transport and Public Works being the responsible organisation. The district municipalities in the province, being the legal successors to the regional services councils, act as the agents of the provincial government for the maintenance of main roads, divisional roads and minor roads.

The Branch is therefore responsible for the proclaimed provincial road network within the Western Cape, consisting of 7 281 km of paved roads, 24 936 km of unpaved roads, and eight weighbridges. The road network of the Province is shown in Appendix F – Maps of the road network.

2.1.1 Legislative requirements

The achievement of the strategic goals of the Branch is guided primarily by the following constitutional and other legislative mandates:

- Constitution of the Republic of South Africa, (Act 108 of 1996).
- The Constitution of the Western Cape, 1998 (Act 1 of 1998).
- Public Finance Management Act, 1999 (Act 1 of 1999 as amended by Act 29 of 1999) and Regulations.
- Public Service Act, 1994 (Act 103 of 1994) and Regulations, 2001 and 2016.
- Western Cape Land Administration Act, 1998 (Act 6 of 1998). National Land Transport Act, 2009 (Act 5 of 2009) and Regulations.
- National Road Traffic Act, 1996 (Act 93 of 1996).
- Cape Roads Ordinance, 1976 (Ord, 19 of 1976).
- Advertising Along Roads and Ribbon Development Act, 1940 (Act 21 of 1940).
- Road Transportation Act, 1977 (Act 74 of 1977).

- Road Safety Act, 1972 (Act 9 of 1972).
- Road Accident Fund Act, 1972 (Act 9 of 1972)
- Road Traffic Management Corporation Act No 20 of 1999.
- Administrative Adjudication of Road Traffic Offences Act No 46 of 1998.
- Infrastructure Development Act No 23 2014.
- Provincial Infrastructure Delivery Management Framework as approved by the Provincial Executive Council.
- Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended by Acts 181 of 1993 and 66 of 1995 and Regulations.
- National Environmental Management Act, 1998 (Act 107 of 1998) and regulations.
- Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) and regulations.
- Western Cape Road Traffic Act, 1998 (Act 12 of 1998).
- Western Cape Toll Roads Act, 1999 (Act 11 of 1999), and the Policy drawn up in terms of Section 16(1) of the Act.
- Preferential Procurement Policy Framework Act, 2000 (Act 5 of 2000) and its regulations.
- Construction Regulation R1010 of 2003 with specific reference to compliance to occupational health and safety within the construction industry.
- Construction Industry Development Board Act 2000 (Act 38 of 2000) with specific reference to the regulation of the construction industry and its 2004 Regulations with specific reference to the registering of contractors and projects.
- Building Industry Bargaining Council Legislation Act 2003 (Act No 25769 of 2003) with specific reference to the protection of employees in the construction industry.
- Broad-Based Black Economic Empowerment Act, 2003 (Act 53 of 2003).
- Local Government: Municipal Systems Act, 1999 (Act 32 of 1999).
- Local Government: Municipal Structures Act, 1998 (Act 117 of 1998).
- Division of Revenue Act, 2007 (Act 1 of 2007 and subsequent Acts).
- Government Immovable Asset Management Act, 2007 (Act 19 of 2007).
- Expropriation Act, 1975 (Act 63 of 1975).
- Western Cape Transport Infrastructure Act, 2013 (Act 1 of 2013).
- Spatial Land Use Management Act, 2013, (Act 16 of 2013) and regulations.
- The Land-use Planning Ordinance Act, 1985 (No 15 of 1985).
- The Western Cape Land-use Planning Act, 2014.
- The Mine Health and Safety Act, 1996 (No 29 of 1996).

2.2 Road network classification

Rural roads in the Western Cape are classified into three main categories:

- National roads, managed by the SA National Roads Agency (SANRAL);
- Western Cape Government provincial roads, managed by the Branch;
- Local municipal roads and streets, managed by the different local municipalities.

Provincial roads are those roads proclaimed as such by the WCG and consist of four categories:

- Trunk roads;
- Main roads;
- Divisional roads; and
- Minor roads.

There are also proclaimed municipal main roads that are subsidised by the Western Cape Government. Other road networks within the Western Cape are the SANRAL national road network and municipal networks.

2.3 The strategic network

A study into the need for provincial strategic road networks was commissioned by the National Department of Transport during 2016. This initiative required that the Branch identify and submit its PRMG strategic road network for year-on-year performance measures based on key performance indices, measuring the outcomes supporting S'Hamba Sonke Programme.

The rationale used by the Branch for determining the strategic road network was based on the premise that the network would assist in supporting economic growth in the Western Cape. The information contained in the Growth Potential Study (Western Cape Government, 2013) (Western Cape Government, 2014) and the Provincial Spatial Development Framework (Western Cape Government, 2014) assisted with the process of selecting paved roads from the hierarchy of road classes in the Western Cape. Roads with predominantly high volumes that connect areas of economic growth potential were selected. The Strategic Provincial Road Network has a length of 3 236 km (carriageway length) of paved roads.

2.4 Road carriageway length

Table 2-1 lists the extent of the road network in terms of length in the Western Cape as described on the Road Network Information System (RNIS) website https://rnis.westerncape.gov.za.

Table 2-1: Centreline length of the road network of the Western Cape as of 13 December 2019

Area	Trunk Roads	Main Roads	Divisional Roads	Minor Roads	Total
PAVED ROADS					
Cape Winelands	386,05	731,95	518,07	124,71	1 760,78
Central Karoo	553,72	63,91	14,82	0,97	633,42
Garden Route	765,52	465,72	272,04	45,47	1 548,75
Overberg	351,71	387,22	193,56	58,24	990,73
West Coast	430,72	887,35	302,05	87,55	1 707,67
City of Cape Town	146,3	84,14	47,02	1,35	278,81
Unicity Road Network	0	296,41	64,75	0,00	361,16
Provincial total	**2 634,02**	**2 916,70**	**1 412,31**	**318,29**	**7 281,32**
UNPAVED ROADS					
Cape Winelands	0	234,41	890,93	1 762,06	2 887,40
Central Karoo	68,07	616,56	1 676,54	3 781,96	6 143,13
Garden Route	63,17	455,09	2 468,31	2 330,81	5 317,38
Overberg	0	115,74	1 161,20	1 455,11	2 732,05
West Coast	0	377,86	1 582,00	5 881,45	7 841,31
City of Cape Town	0	0	0,00	14,53	14,53
Provincial total	**131,24**	**1 799,66**	**7 778,98**	**15 225,92**	**24 935,80**

Table 2-1: Centreline length of the road network of the Western Cape as of 13 December 2019					
Area	**Trunk Roads**	**Main Roads**	**Divisional Roads**	**Minor Roads**	**Total**
All ROADS					
Cape Winelands	386,05	966,36	1 409,00	1 886,77	4 648,18
Central Karoo	621,79	680,47	1 691,36	3 782,93	6 776,55
Garden Route	828,69	920,81	2 740,35	2 376,28	6 866,13
Overberg	351,71	502,96	1 354,76	1 513,35	3 722,78
West Coast	430,72	1265,21	1 884,05	5 969,00	9 548,98
City of Cape Town	146,3	84,14	47,02	15,88	293,34
Unicity Road Network	0	296,41	64,75	0,00	361,16
Provincial total	**2 765,26**	**4 716,36**	**9 191,29**	**15 544,21**	**32 217,12**
CARRIAGEWAY LENGTH OF THE MANAGED ROAD NETWORK USED IN THE SITATIONAL ANALYSIS (CHAPTER 4)					
Paved	2 632,71	2 823,28	1 352,46	254,52	7 062,97
Unpaved	131,24	1 800,08	7 771,14	648,16	10 350,62
Total managed	**2 763,95**	**4 623,36**	**9 123,60**	**902,68**	**17 413,59**
CARRIAGEWAY LENGTH OF THE MANAGED ROAD NETWORK USED IN THE ANALYSIS (CHAPTER 5)					
Paved	2 635,88	2 512,59	1 271,72	261,16	6 681,35
Unpaved	131,24	1 800,08	7 798,65	585,17	10 315,14
Total managed	**2 767,12**	**4 312,67**	**9 070,37**	**846,33**	**16 996,49**

Note, the variance between the three data sources used for the provincial network and the managed network is due to:

- The RNIS is a system that is dynamically managed, while the PMS and GRMS are static for a twelve-month period.
- The Situational Analysis of this report is based on the 2019 data and the needs analysis was conducted on the 2018 data, since the Branch is only conducting a needs analysis every second year.

The UniCity roads were added to the road asset register in this report. These roads were maintained by the City of Cape Town (CoCT) and the condition of these roads has deteriorated to such an extent, that CoCT are not able to maintain the road infrastructure to an appropriate level of service. As the road authority, the branch has collected the conditional data for these roads and will evaluate and analyse this infrastructure at a network level.

Historical information on the condition of the individual roads, the road network and the traffic carried is available from the RNIS at https://rnis.westerncape.gov.za/rnis .

All references to the length of the WCG road network are "carriageway length", thus including the length of dual carriageways in both directions. **Note:** From this point forward, the reference to the WCG network includes only the "managed road network" by the WCG Branch. The road network information has been updated to the format provided by National Department on Transport in September 2019 and this is provided in Appendix P – Road Network Information.

With reference to the circular dated the 10 June 2021, the final RAMP submitted in March 2021 were requested to be used as the Draft 2022/23 RAMP and this was submitted to National Department of Transport at the end of June 2021. This request was to ensure alignment to the National Treasury budget and uniformity among all road authorities' plans. This change has caused that the Branch therefore have not updated analysis and condition sections in the cycle RAMP, to ensure alignment with the information submitted in June 2021, and will update these chapters in the RAMP 2023/24.

Details of the national road network in the Western Cape are shown in Table 2-2.

Table 2-2: National road network in the Western Cape					
National Road No.	**1**	**2**	**7**	**300**	**Total**
Length, km	542,45	517,00	384,70	16,44	1 460,59

The proclaimed municipal main road network is 299,97 km. The WCG contributes subsidies to the municipalities to maintain these proclaimed main roads. Data on the full extent of the municipal road networks in the Western Cape is not available.

2.5 Paved roads versus unpaved roads

Paved roads comprise 40% of the managed road network length investigated, but the traffic data indicates 96% of vehicle-km is travelled on paved roads. It is, therefore, reasonable to say that a focus on the maintenance and rehabilitation of paved roads will influence the maximum number of road users. This policy has historically been followed and, according to the current funding scenario, between 74% and 89% of the maintenance and rehabilitation funds of the Branch has been allocated towards the preservation of the paved road network.

The current asset value of paved roads is 96% of the total network's value, requiring a large input of funding to preserve the paved roads in a functional condition and minimising the road user costs for 95% of the road users. The provincial road network of the Western Cape Government carries more than 10,8 billion vehicle-km per annum. **Only 4% of this annual traffic is travelled on unpaved roads.**

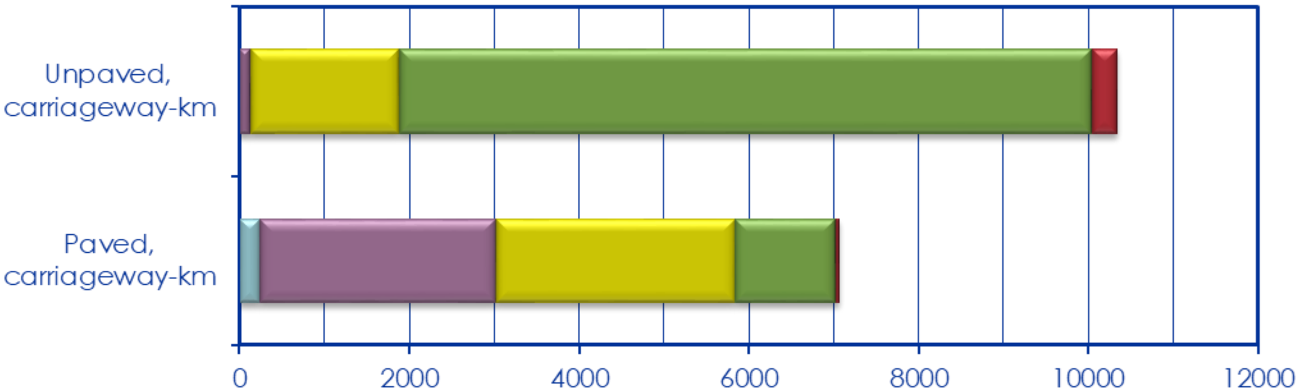
2.6 Road classification

Table 2-3 provides details of the six-class rural and urban road classification system used in TRH 26: South African Road Classification and Access Management Manual (Committee of Transport Officials, 2012).

The functional road classification for the WCG-maintained rural road network according to TRH 26 (Committee of Transport Officials, 2012) is shown in Figure 2-1. Figure 2-2 shows the subsidised municipal proclaimed main roads network. The majority of paved roads are classified as class R2 that provide mobility, and the majority of unpaved roads are classified as class R4 that provide access.

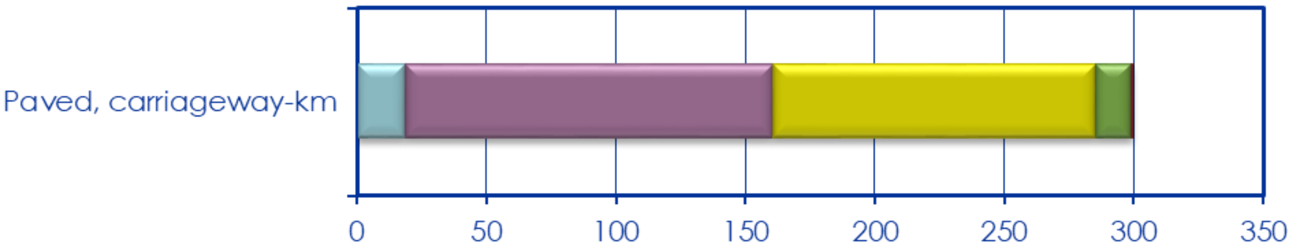
Table 2-3: Road network classification according to TRH 26 for rural and urban roads

Class	Function	Description
1	Mobility	Principal arterial
2		Major arterial
3		Minor arterial
4	Access/activity	Collector street
5		Local street
6		Walkway



	Paved, carriageway-km	Unpaved, carriageway-km
R1	237,60	0,00
R2	2774,04	131,24
R3	2823,87	1743,93
R4	1183,38	8164,78
R5	44,08	310,78

Figure 2-1: The WCG maintained rural road network classification according to TRH 26 (June 2020)



	Paved, carriageway-km
U1	18,39
U2	142,16
U3	124,38
U4	13,97
U5	1,07

Figure 2-2: The urban WCG proclaimed municipal main road network classification according to TRH 26 (June 2020)

2.7 Overload control

Overloading of road freight vehicles results in excessive road deterioration, which increases the cost of road maintenance. In addition, overloaded vehicles are a safety risk because they are difficult to control and have greater likelihood of getting defects such as brake failure. As a result, overload control is a crucial component of road infrastructure management.

Table 2-4 provides the statistics of the overloaded vehicles on the provincial road network over the last ten years. The percentage of vehicles overloaded on the network has followed an upward trend from 2015/16 to 2018/19 but has decreased slightly in 2019/20.

Table 2-4: Overload control statistics

Year	2011/12	2012/13	2014/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Vehicles weighed	631 830	700 015	658 256	673 920	651 541	592 054	618 744	632 538	599 976
Vehicles legal	554 395	619 816	574 611	597 127	575 041	518 832	533 814	540 902	517 602
Vehicles overloaded	77 435	80 199	83 545	76 793	76 500	73 222	84 930	91 636	82 374
% Vehicles overloaded	12,30	11,50	12,70	11,40	11,70	12,40	13,70	14,49	13,73
% Overloaded within 5% limit	9,90	9,40	10,60	9,30	9,70	10,20	11,70	12,40	11,80

It follows from the Table 2-4 , that the upward trend is caused by several issues contributing to the overload control challenges including:

- A lack of capacity to extend the operating hours at certain weighbridges. Several weighbridges do not operate around the clock;
- The ease of communication regarding enforcement operations;
- A weak regulatory framework for overload control, limiting the chances of successful prosecution in certain cases; and
- Penalties that are not strong deterrents to offenders.

Figure 2-3 provides an historical view on vehicles weighed, showing the percentage of overloaded vehicles and those within the 5% warning limit.

In addition to the increase in overloading, many overloaded vehicles still escape prosecution by avoiding those sections of road with weighbridges by using and damaging other roads not designed for such heavy loads. Of further interest is the large percentage of vehicles that are overloaded within the 5% warning limit. This indicates that operators may be deliberately overloading within the warning range knowing that they will escape fines if detected. A reduction in the 5% warning limit may have to be considered to address this issue.

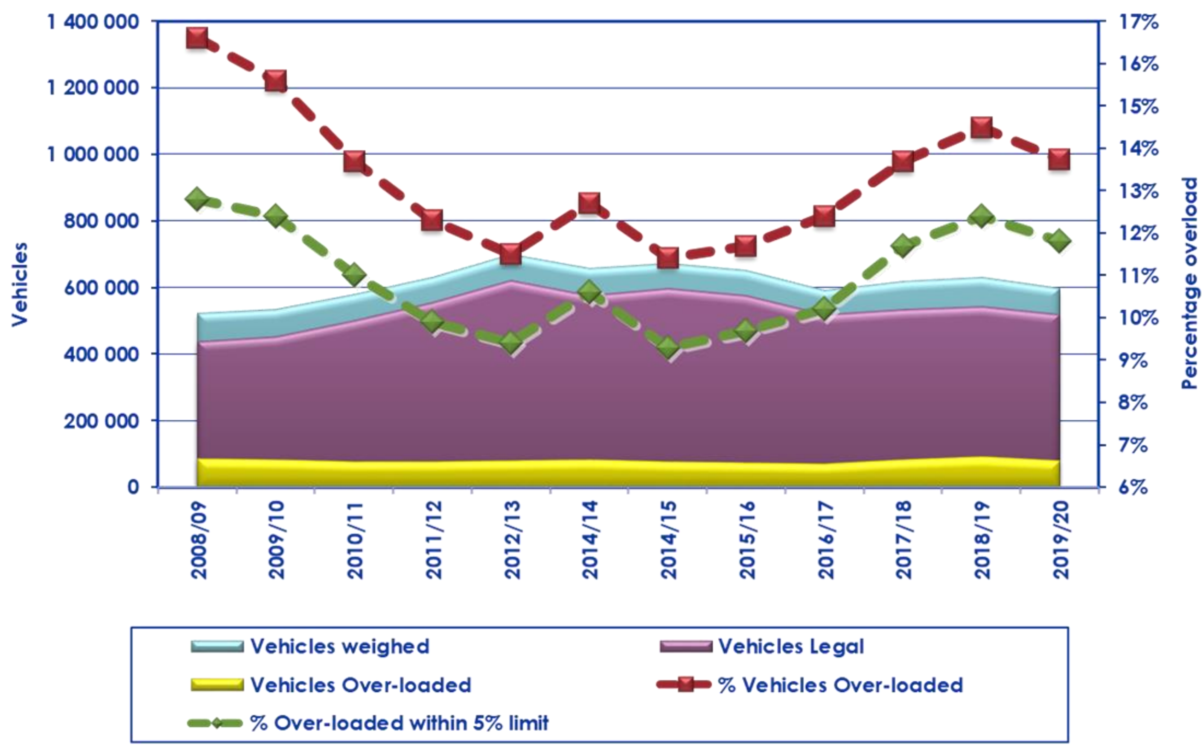


Figure 2-3: Historical trend of vehicles weighed

The introduction of Weigh-In-Motion technology to screen 100% of the traffic stream for possibly overloaded vehicles has been successfully implemented at the Beaufort West Overload Control Centre. This and other advances in technology will be monitored and implemented where applicable to improve the efficiency and effectiveness of overloading control.

To initiate sustainable freight transport delivery in the Western Cape, the provincial Government has developed the Provincial Freight Strategy. The Freight Strategy includes strategic actions to address the key issues in freight transport delivery in the Western Cape, where successful implementation of the Strategy will help in the transition to sustainable freight delivery.

2.8 Structure data

Table 2-5 lists the summary of structural assets and road signs per area in terms of number in the Western Cape Province.

Table 2-5: Summary of structural assets per road type and area as of March 2020

Area	Bridges	Large culverts	Gantries	Road Signs
PAVED ROADS				
Cape Winelands	164	374	0	12 564
Central Karoo	71	203	0	6 182
Garden Route	144	313	0	11 101
Overberg	75	173	0	5 247
West Coast	102	149	0	8 005
City of Cape Town	175	59	74	4 317
Provincial Total	**731**	**1 271**	**74**	**47 416**

Table 2-5: Summary of structural assets per road type and area as of March 2020				
Area	**Bridges**	**Large culverts**	**Gantries**	**Road Signs**
UNPAVED ROADS				
Cape Winelands	23	87	0	2 639
Central Karoo	19	134	0	4 111
Garden Route	31	232	0	4 555
Overberg	40	76	0	2 381
West Coast	33	0	0	3 040
City of Cape Town	0	0	0	1
Provincial Total	**146**	**529**	**0**	**16 727**
All ROADS				
Cape Winelands	187	461	0	15 203
Central Karoo	90	337	0	10 293
Garden Route	175	545	0	15 656
Overberg	115	249	0	7 628
West Coast	135	149	0	11 045
City of Cape Town	175	59	74	4 318
Provincial Total	**877**	**1 800**	**74**	**64 143**

Additional structure information was collected during the visual assessments on the bridges, however this data still needs to be verified and validated. Table 2-5 shows a summary of the structure data collected in the field.

Table 2-6: Structures included in the visual condition data per district as of March 2020						
Area	**Bridge**	**Bridge - Arch**	**Bridge Cellular**	**Culvert Major**	**Retaining Wall**	**Sign Gantry**
Cape Winelands	199	2	11	434	8	0
Central Karoo	84	0	6	341	0	0
Garden Route	169	6	21	540	60	0
Overberg	100	5	14	214	1	0
West Coast	127	1	7	201	1	0
City of Cape Town	102	2	0	36	9	30
Total	**781**	**16**	**59**	**1766**	**79**	**30**

Chapter 3 – Level of Service

3.1 Minimum conditions and standards

3.1.1 Road network

Through years of international and local research, the needs of the public in respect of road standards, and thus levels of service, have been established. These standards are documented in a great variety of publications, the most important of which are listed in Appendix J – Standards and specifications. A number of different surveillance measurements are done at set frequencies to determine the condition of the road network. These are shown in Table 3-1 and Table 3-2. In addition to these measurements, the traffic is counted at selected nodes on all paved and unpaved roads.

Table 3-1: List of paved network surveillance measurements and levels of service

Type of surveillance	Frequency of measurement	Compliance with TMH 22	Level of Service			Usage
			Class	TRH 26	Limit	
Visual condition (see note below) VCI (min)	Whole network[1] annually	Yes	DR/OP	4, 5	≥45,0	Functional and structural condition Seal programme Maintenance programme Condition Report
			MR	3	≥52,5	
			TR	1, 2	≥55,0	
Longitudinal profiles IRI (m/km) (max)	Whole network[1] every 2 years	Yes[2]	DR/OP	4, 5	≤5,6	Functional condition Rehabilitation programme Condition Report
			MR	3	≤4,5	
			TR	1, 2	≤4,2	
Transverse profiles Rut depth (mm) (max)	Whole network[1] every 2 years	Yes[2]	DR/OP	4, 5	≤20	Functional and structural condition Seal programme Condition Report
			MR	3	≤20	
			TR	1, 2	≤20	
Surface texture MPD (mm) (min.)	Whole network[1] every 2 years	Yes[2]	DR/OP	4, 5	≥0,4	Functional condition Seal programme Condition Report
			MR	3	≥0,4	
			TR	1, 2	≥0,4	
Deflection SN	One third of the network[1] every year	Yes	N/a			Structural condition Rehabilitation programme Condition Report
Video images	Whole network[1] every 2 years	N/a	N/a			Orientation Seal programme Rehabilitation programme Maintenance programme Miscellaneous usage

Note 1: This does not include the proclaimed municipal main roads
Note 2: The data collection of the mechanical surveillance measurements on the paved road network has initiated, with a consultant being appointed in the last quarter of 2021/22.

Table 3-2: List of unpaved network surveillance measurements and levels of service				
Type of surveillance	**Frequency of measurement**	**Index and compliance with TMH 22**	**Level of Service**	**Usage**
Visual condition (see note below) VCI (max)	Annually on the maintained network	N/a	Not currently available	Functional and structural condition Regravel programme Reshape & rework programme Maintenance programme Upgrade programme Condition Report
Gravel thickness millimetres	Annually on the maintained network	N/a	Minimum of 50 mm	Structural condition Regravel programme Reshape & rework programme Maintenance programme Upgrade programme Condition Report
Dynamic Cone Penetrometer DN	Ad hoc	N/a	Gravel wearing course: Minimum CBR range: 9 – 15 depending on subgrade and traffic	Structural condition Upgrade programme Maintenance programme

The preliminary classification of the Levels of Service for unpaved roads is shown in Table 3-3.

Table 3-3: Preliminary classification of unpaved network levels of service				
Level of Service	**Mobility Speed (km/h)**	**Roughness Intervention Level (90th percentile) IRI**	**Accessibility (capacity of a normal car to negotiate the roads without losing traction)**	**Safety in terms of dustiness (visual assessment rating based on TRH12)**
High	80	7,5	99,5%: In service for ≥ 363 days pa	≤3
Medium	60	10	99%: In service for ≥ 361,5 days pa	≤4
Low	40	13	99%: In service for ≥ 361,5 days pa	≤4
Very low	20	15	99%: In service for ≥ 361,5 days pa	≤5

Table 3-4 provides the preliminary network targets for each Key Performance Indicator and Level of Service.

Table 3-4: Preliminary network targets					
Key Performance Indicators	**LOS**				
	High	**Medium**	**Low**	**Very low**	**AM Objectives**
Average gravel thickness (mm)	≥60	≥60	n/a	n/a	1
Target average roughness[1] (IRI)	≤4	≤5	≤6	≤6	1, 4
Network Condition Number[2]	≥60	≥50	Not set	Not set	1
Accessibility (days pa)	≥363	≥361,5	≥361,5	≥361,5	1
Average dustiness to TMH 9	≤2	≤3	≤3	≤4	1
Average Annual Gravel loss (mm)	<10	<7	n/a	n/a	2, 4
Upgrade to paved standard	As per dTIMS	As per dTIMS	n/a	n/a	3, 5

3.1.2 Structures

Table 3-5 shows the surveillance measurements for structures and major culverts. Currently, there are two condition indices calculated on structures, Priority condition index (PCI) and Average condition index (ACI), however levels of service have not yet been determined.

Table 3-5: Structures and major culverts surveillance measurements and levels of service

Type of surveillance	Frequency of measurement	Index and compliance with TMH19	Level of Service	Usage
Visual condition	5 years	PCI and ACI is calculated	Not available	Functional and structural condition Maintenance programme Condition Report

As of March 2020, 1800 major culverts and 877 bridges were inspected. This data is still undergoing Quality Assurance, but it is added to the report under engineering condition for structures.

3.1.3 Overload control

Ideally, the overloading of heavy vehicles on all roads should be eliminated. This is not likely and the Desired Budget for overloading control is based on the following level of service:

- Less than 10% of heavy vehicles should be overloaded
- Less than 2% of heavy vehicles should be overloaded to such an extent that they are charged for the transgression.

3.1.4 Division of Revenue Act

The Division of Revenue Act has not published any changes to the level of service for the transportation assets.

Chapter 4 – Situational Analysis

4.1 Inventory Data

Detailed information on the network, the traffic it carries and its condition is available on the RNIS at https://rnis.westerncape.gov.za. This chapter's analysis is based on the 2019 visual assessment data, as well as the latest data for all other measurements. Other asset data is related to the latest available data.

A summary of the road network under jurisdiction of the Branch, per road type and RCAM class is provided in Table 4-1. This network is maintained by the Branch, except for the Main Roads within the City of Cape Town. A summary of the structures is provided in Table 4-2.

A tabular summary of the age of the assets, per asset type, is provided in Table 4-40.

Figure 4-1 presents the distribution of the 17 413 km of Western Cape carriageway length that are being maintained. Included are Trunk, Main and Divisional roads for both paved and gravel networks, as well as some of Minor roads.

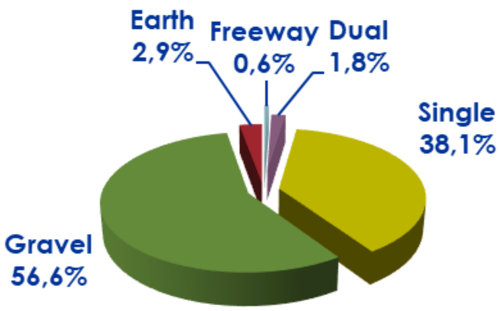


Figure 4-1: Road network distribution of carriageway length as at June 2020 (including UniCity roads)

Table 4-1: Summary of the roads being maintained as of June 2020

Area	RCAM Class	Paved						Unpaved		Total km	%
		Freeway		Dual carriageway		Single carriageway		Gravel km	Earth km		
		lane-km	cway-km	lane-km	cway-km	lane-km	cway-km				
Cape Winelands	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,00	0,00	125,64	62,96	1223,79	576,13	0,00	0,00	639,09	3,67
	3	0,00	0,00	13,28	6,64	1119,87	558,68	247,08	0,00	812,40	4,67
	4	0,00	0,00	0,00	0,00	935,47	467,03	1095,84	46,82	1609,69	9,24
	5	0,00	0,00	0,00	0,00	32,00	16,00	9,86	12,79	38,65	0,22
Central Karoo	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,00	0,00	0,00	0,00	1088,96	544,48	68,07	0,00	612,55	3,52
	3	0,00	0,00	0,00	0,00	129,80	64,90	410,75	0,00	475,65	2,73
	4	0,00	0,00	0,00	0,00	26,53	12,53	1768,67	36,71	1817,91	10,44
	5	0,00	0,00	0,00	0,00	0,00	0,00	87,66	0,00	87,66	0,50
Garden Route	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,00	0,00	0,00	0,00	1501,84	743,14	63,17	0,00	806,31	4,63
	3	0,00	0,00	0,00	0,00	822,03	392,71	406,98	0,00	799,69	4,59
	4	0,00	0,00	0,00	0,00	544,64	271,37	2373,78	40,73	2685,88	15,42
	5	0,00	0,00	0,00	0,00	35,76	17,15	121,61	1,01	139,77	0,80
Overberg	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,00	0,00	11,08	5,54	559,02	279,51	0,00	0,00	285,05	1,64
	3	0,00	0,00	0,00	0,00	899,98	449,99	189,34	0,00	639,33	3,67
	4	0,00	0,00	0,00	0,00	329,14	164,57	843,36	298,51	1306,44	7,50
	5	0,00	0,00	0,00	0,00	20,00	10,00	26,19	0,00	36,19	0,21
West Coast	1	0,00	0,00	0,00	0,00	174,36	87,18	0,00	0,00	87,18	0,50
	2	0,00	0,00	47,87	19,34	745,44	372,72	0,00	0,00	392,06	2,25
	3	0,00	0,00	0,00	0,00	1829,90	898,16	486,04	3,74	1387,94	7,97
	4	0,00	0,00	0,00	0,00	522,16	261,08	1598,13	57,12	1916,33	11,00
	5	0,00	0,00	0,00	0,00	1,86	0,93	51,66	0,00	52,59	0,30
City of Cape Town	1	182,61	81,84	137,96	68,98	0,00	0,00	0,00	0,00	150,82	0,87
	2	37,46	18,73	148,84	74,42	132,42	66,21	0,00	0,00	159,36	0,92
	3	0,00	0,00	5,08	2,54	169,08	84,54	0,00	0,00	87,08	0,50
	4	0,00	0,00	0,00	0,00	13,60	6,80	5,00	0,00	11,80	0,07
	5	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
UniCity	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,00	0,00	14,56	7,28	6,36	3,18	0,00	0,00	10,46	0,06
	3	0,00	0,00	143,14	71,57	588,28	294,14	0,00	0,00	365,71	2,10
	4	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	5	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total		220,07	100,57	647,45	319,27	13452,29	6643,13	9853,19	497,43	17413,59	-
%		0,6%		1,8%		38.1%		56,6%	2,9%	100%	

NOTES: Table Includes UniCity Roads

Table 4-2: Summary of other assets being maintained as of June 2020								
Area	RCAM Class	Paved Roads				Unpaved Roads		
		Bridges no.	Large culverts no.	Gantries no.	Road Signs no.	Bridges no.	Large culverts no.	Road Signs no.
Cape Winelands	1	0	0	0	0	0	0	0
	2	68	208	0	6 733	0	0	0
	3	53	98	0	2 915	6	18	381
	4	41	66	0	2 850	17	69	2 250
	5	2	2	0	66	0	0	8
Central Karoo	1	0	0	0	0	0	0	0
	2	68	179	0	5 744	2	16	195
	3	3	21	0	371	6	27	707
	4	0	3	0	67	10	91	3 129
	5	0	0	0	0	1	0	80
Garden Route	1	0	0	0	0	0	0	0
	2	92	225	0	8 747	1	11	119
	3	31	55	0	998	5	25	745
	4	20	31	0	1 277	23	185	3 505
	5	1	2	0	79	2	11	186
Overberg	1	0	0	0	0	0	0	0
	2	36	59	0	2 509	0	0	0
	3	26	86	0	1 605	12	11	332
	4	12	28	0	1 115	28	65	2 007
	5	1	0	0	18	0	0	42
West Coast	1	4	2	0	527	0	0	0
	2	37	40	0	3 067	0	0	0
	3	48	88	0	2 956	6	0	555
	4	13	19	0	1 450	25	0	2 430
	5	0	0	0	5	2	0	55
City of Cape Town	1	109	22	0	2 116	0	0	1
	2	60	23	74	1 484	0	0	0
	3	6	14	0	662	0	0	0
	4	0	0	0	55	0	0	0
	5	0	0	0	0	0	0	0
Total		633	731	1 271	74	47 416	146	529
%		1,0	1,1%	1,9%	0,1%	70,9%	0,2%	0,8%

Notes:

- The ‘NR’ (SANRAL) road structures have been excluded.
- The UniCity and Municipal Main roads have also been excluded (not logged)
- Structures from both carriageways included (previously not)
- Included structures with Structure Numbers ending in ‘A’, ‘B’, ‘C’, ‘D’, ’E’ or ‘F’.

In addition to the infrastructure being maintain on the road network, the Branch also maintains plant equipment and the extent of these assets are represented in Table 4-3 .

The sub directorate Mechanical servers are responsible for the maintenance of all plant equipment, that supports the delivery of projects, including the in-house team and district municipalities. A summary of the extensive asset base used for this support is shown below.

Table 4-3: Plant equipment in the Western Cape as of July 2020

Equipment Type	Number
Pavement Breaker	99
Bus	81
Caravan	219
Compactor	91
Compressor	58
Crane	2
Crawler Tractor	3
Mobile Crusher	1
Ferry	1
Generator	45
Grader	146
Pneumatic Loader	39
Road Marking Machines	18
Concrete Mixer	93
Mobile Home	4
Mower	248
Pumps	186
Roller (Pneumatic, Vibrating Steel and Tandem)	159
Chip Spreader	11
Road Sweeper	17
Tank (Water and Fuel)	36
Tractors	103
Trailers	337
Trucks	395
Vans	258
Vibrators	32
Welders	48

4.2 Usage of the Assets

Traffic counts on all managed provincial roads are undertaken on a regular basis to establish the use of, and usage patterns on the road network.

A tabular summary of the usage of the assets, per road type and RCAM class and administrative area, in average daily vehicle-km, calculated for carriageway lengths, is shown in Table 4-4. The total for the paved network is 19,60 million vehicle-km per day and for the unpaved network it is 0,96 million vehicle-km per day, totalling 20,56 million vehicle-km per day, or 7,5 billion vehicle-km annually.

Table 4-4: Summary of the roads usage as at May 2019						
Area	RCAM Class	Average daily vehicle-km for 2019				
		Paved roads			Unpaved roads	
		Freeway carriageway	Dual carriageway	Single Cway Bi-directional	Gravel	Earth
Cape Winelands	1	0	0	0	0	0
	2	0	673 887	3 785 858	0	0
	3	0	13 310	935 771	22 011	0
	4	0	0	288 048	112 425	209
	5	0	0	14 589	22	0
Central Karoo	1	0	0	0	0	0
	2	0	0	243 301	3 958	0
	3	0	0	11 881	28 846	0
	4	0	0	1 945	60 482	228
	5	0	0	0	668	0
Garden Route	1	0	0	0	0	0
	2	0	0	1 472 004	5 579	0
	3	0	0	399 107	60 257	0
	4	0	0	171 221	244 431	1 259
	5	0	0	13 447	14 615	6
Overberg	1	0	0	0	0	0
	2	0	59 862	1 064 285	0	0
	3	0	4 488	585 438	39 500	0
	4	0	58	101 311	134 681	25 960
	5	0	0	3 321	2 334	463
West Coast	1	0	0	412 735	0	0
	2	0	121 249	1 199 336	0	0
	3	0	0	930 992	66 911	0
	4	0	0	105 788	156 393	403
	5	0	0	561	5 119	0
City of Cape Town	1	4 629 240	617 557	5 578 732	0	0
	2	560 824	993 616	1 816 121	0	0
	3	0	70 747	457 960	0	0
	4	0	0	8 784	0	0
	5	0	0	0	0	0
Total		5 190 064	2 554 774	19 602 536	958 232	28 528
%		18,3%	9,0%	69,2%	3,4%	0,1%

NOTES:

- Data excludes UniCity roads

4.2.1 Traffic demand

The most relevant indicator of traffic growth is the number of vehicle-km travelled on the network over a given time period. The Branch conducts an ongoing vehicle counting programme and regularly updates the RNIS with the latest link-lengths. The Branch can therefore accurately report on vehicle-km on the network.

There was a steady growth of approximately 2,5% in vehicle-km travelled in the last few years from 2016 to 2019, as illustrated in Figure 4-2. This reflects current moderate economic markets in South Africa.

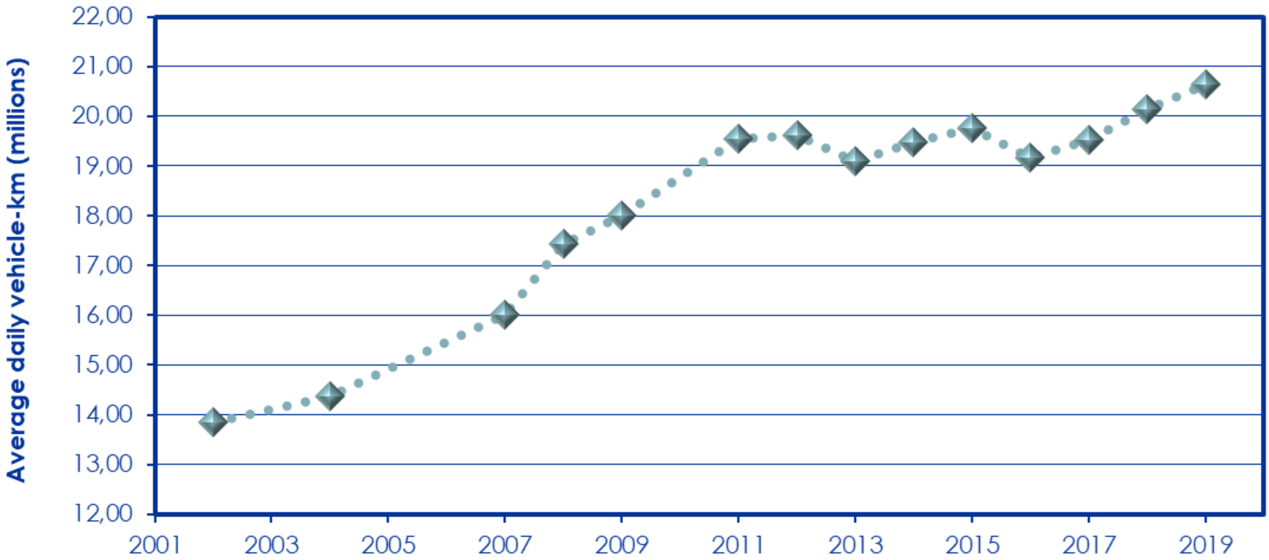


Figure 4-2: Growth in average daily vehicle-km on the WCG network 2002 to 2019 (excluding UniCity roads)

The different traffic categories and their proportion of the paved and unpaved road network, expressed as a percentage, are shown in Table 4-5 and Figure 4-3. It is evident how the majority of the network (63%) is composed of roads with traffic volumes of less than 300 vehicles per day.

Table 4-5: Traffic categories for 2020 (excluding UniCity roads)

Traffic category	AADT	Managed network length km	% of managed network
S0	<100	6517	39,9
S1	101 – 300	3774	23,1
T0	301 – 500	1699	10,4
T1	501 – 1 500	2006	12,3
T2	1 501 – 4 500	1628	10,0
T3	4 501 – 13 500	386	2,4
T4	13 501 – 40 000	273	1,7
T5	>40 000	62	0,4
Total		16 346	100

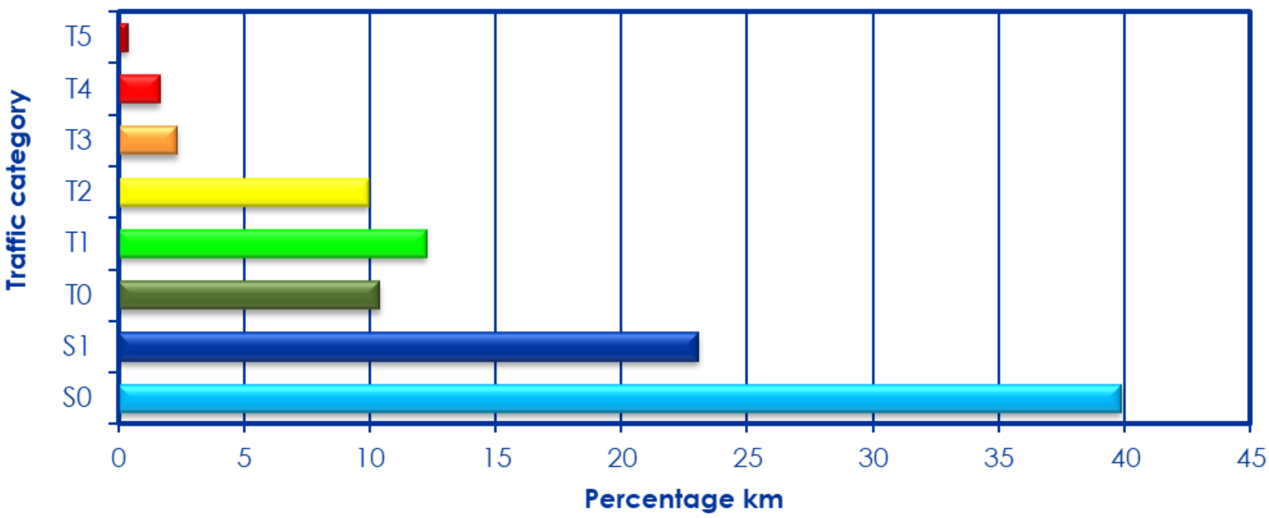


Figure 4-3: Traffic categories and their percentage of km of the network for 2020 (excluding UniCity roads)

The distribution of traffic on paved and unpaved roads is shown in Figure 4-4. The findings from the distribution of traffic are:

- 39% of the road network carries less than 100 vehicles per day.
- 4% of the road network carries more than 10 000 vehicles per day.

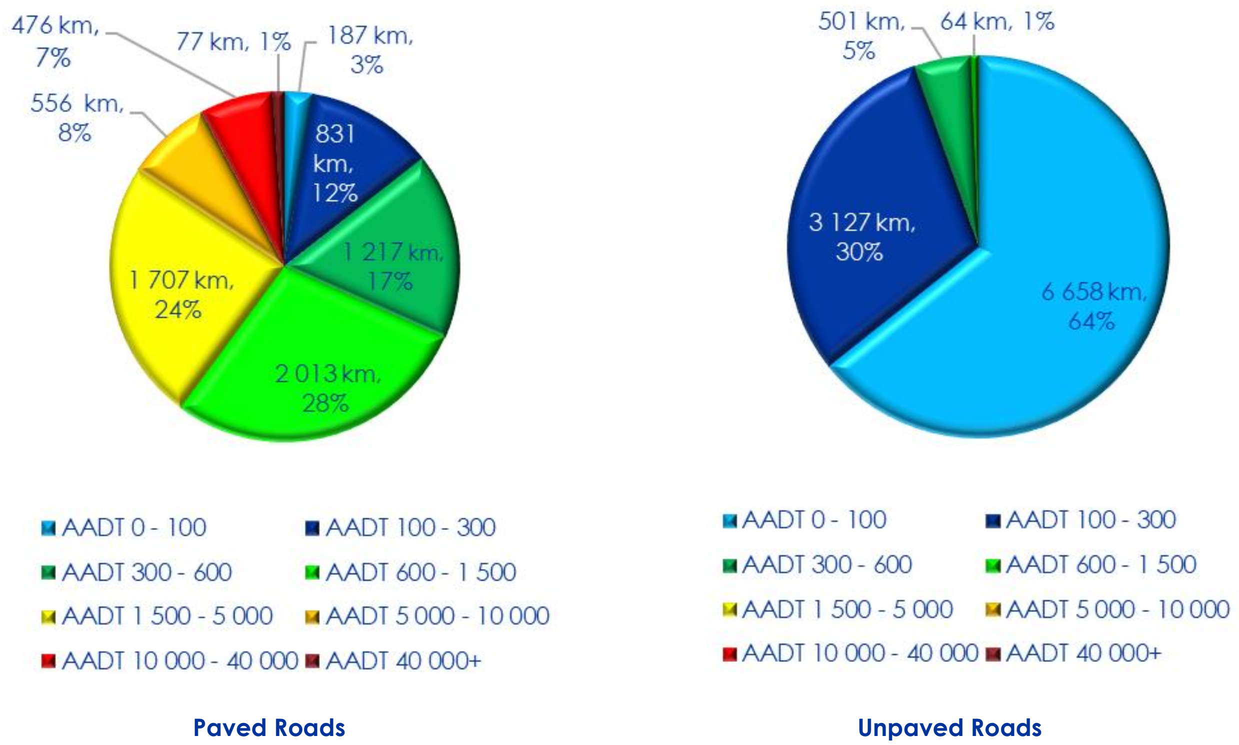


Figure 4-4: Traffic distribution on paved and unpaved roads 2020

Figure 4-4 shows that there are 64 km of unpaved roads that carry more than 600 vehicles per day, and another 501 km that carry between 300 and 600 vehicles per day. These unpaved roads may warrant upgrading to paved standards due to the economic benefits that would accrue, as well as the difficulty of maintaining these roads as a result of very high gravel loss that triggers the need for frequent regravelling.

4.3 Engineering Condition of the Assets

4.3.1 Background

The condition of the paved road network is surveyed by means of visual evaluations and instrument surveys at frequencies that are in accordance with draft TMH 22: Road Asset Management Manual (Committee of Transport Officials, 2013), unless otherwise indicated.

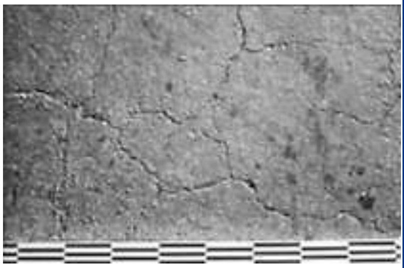
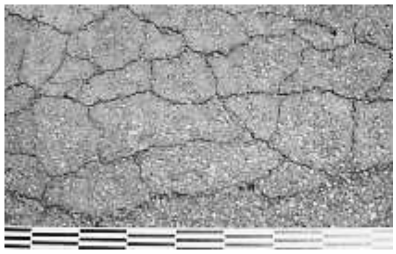
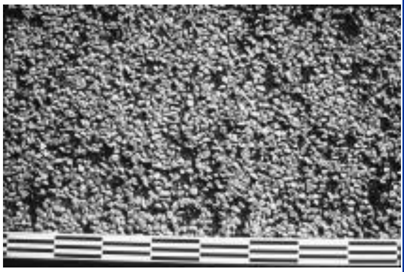
4.3.2 Visual condition of the paved road network

Visual assessment surveys are arranged annually (Table 3-1) to collect and record condition information on the paved managed road network of the WCG using TMH 9: Pavement Management Systems: Standard Visual Assessment Manual for Flexible Pavements (Committee of State Road Authorities, 1992). The surveys are completed on all surfaced roads.

Surveys are done on the roads in both directions for dual carriageways because the condition and pavement information are different.

Table 4-6 presents examples of some of the types of distress collected during the visual assessment surveys. The distresses shown here are those typically modelled in the lifecycle cost analysis to predict future pavement performance.

Table 4-6: Examples of distresses collected on the paved road network surveyed according to TMH 9

Surfacing cracks Example of degree 3 rating (distinct cracks).		Crocodile cracks Example of degree 3 rating (distinct cracks with slight deformation of cracked areas).	
Stone loss Example of degree 3 rating (distinct loss in small areas).		Rutting Example of degree 5 rating (severe, dangerous, >30 mm).	
Pothole Example of degree 3 rating (>200 mm diameter and significant depth).			

The Visual Condition Index (VCI) is based on a composite rating of all the distresses that are surveyed annually. The visual condition index is categorised as very poor (0-30%), poor (30-50%), fair (50-70%), good (70-85%), and very good (85-100%) as shown in Table 4-7.

Table 4-7: Categories of visual condition

VCI range (%)	Description	Colour used in charts & graphs
0 – 29	very poor	
30 – 49	poor	
50 – 69	fair	
70 – 84	good	
85 – 100	very good	

Table 4-8 shows examples of road visual conditions.

Table 4-8: Examples of visual condition Indices on paved roads in the Western Cape Province

Very Poor condition category


TR01608 (Murraysburg)


DR01111 (Kalbaskraal)

Poor condition category


MR00536 (Eendekuil)


TR03303 (Oudtshoorn)

Fair condition category


TR00101 (Outeniqua Pass)


TR08301 (Garcia Pass)

Good condition category


TR03402 (Prince Albert)


DR02181 (Marcuskraal)

Very Good condition category


MR00174 (Stellenbosch)


MR00526 (Porterville)

The following figures, showing selected aspects of the infrastructure conditions, were prepared from the information in the Road Network Information System.

The condition distribution of 7 063 carriageway-kilometres of the paved road network, which is managed by the Pavement Management System by length and vehicle-km is shown in Figure 4-5 (2019 figures). This condition distribution includes the UniCity roads but excludes proclaimed municipal main roads.

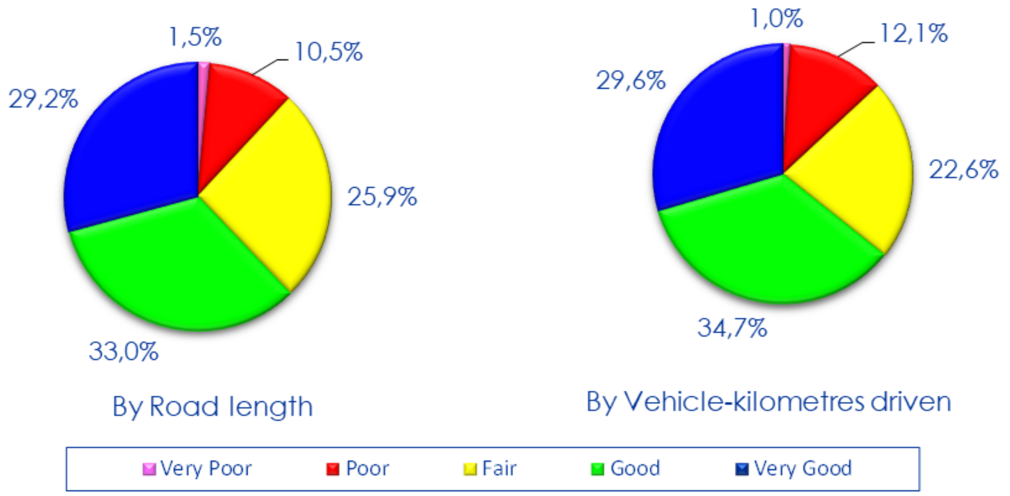


Figure 4-5: Distribution of the VCI of paved roads by road length and vehicle-km as at December 2019 including UniCity roads

Figure 4-6 presents the visual condition distribution of paved roads based on the 2019 assessment data. The comparison shows that **an effective economic maintenance policy is being followed by the Branch** because the condition distribution per vehicle-kilometre driven is superior to the condition distribution per road length. The objective of maximising the road condition for the maximum number of road users is therefore achieved.

It is noticeable that 29,6 % of vehicles-kilometres and 37,2% of passengers-kilometres are driven on the 29,2% of roads that are in "very good" condition. The usage of the 12% of roads in "poor to very poor" condition affects 13% of road users. According to the recommendations of the Road Infrastructure Strategic Framework for South Africa (Department of Transport, 2006), it is desirable that not more than 10% of the length of a road network is in a poor to very poor condition. However, this recommendation does not take account of the distribution of traffic volumes on the network. Taking only length of paved road into account, about 11.9% of the paved road network is in a poor to very poor condition including the UniCity roads (excluding UniCity roads 9,59%). Taking the traffic distribution into account, 13,1% of the network is in poor to very poor condition including UniCity roads (excluding UniCity roads, 8.1%). The UniCity roads added to the road network this year has an impact on the sound principle followed previously by the branch.

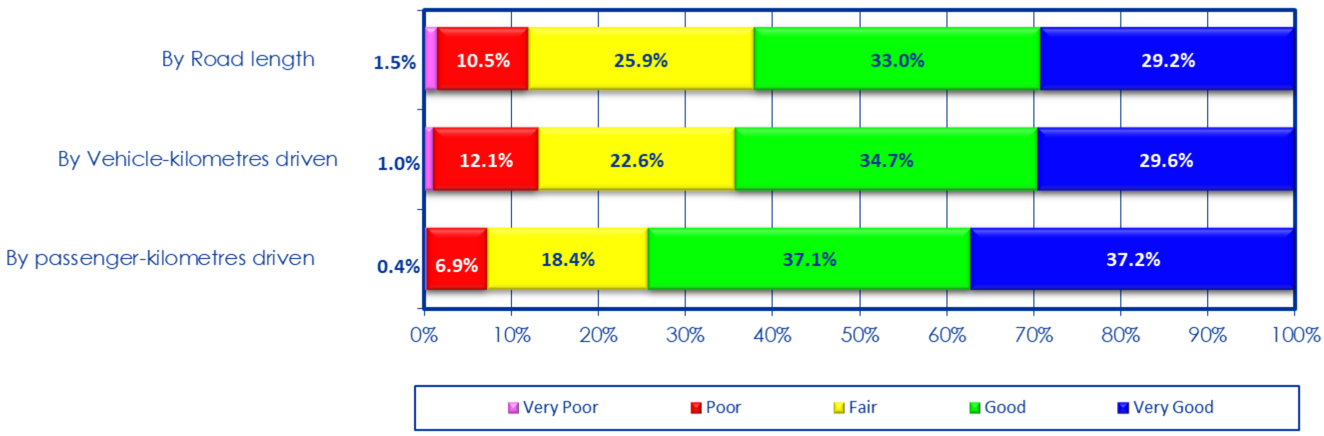


Figure 4-6: Paved roads condition distribution as at December 2019 including UniCity roads

The following observations can be deduced from Figure 4-6:

- In terms of road length, 62% of roads are in the good to very good condition category.
- In terms of vehicle usage, 64% of vehicle-km are travelled on roads in the good to very good condition category.
- In terms of passenger usage, 74% of passenger-km are travelled on roads in the good to very good condition category.

Since 2012, the overall visual condition distribution by road length has improved (refer to paragraph 4.9, Visual condition trends) , however with the inclusion of the UniCity roads a slight deteriorating is noticed.

Although the visual condition gives clues to the structural condition of the road network and its ability to carry traffic loading, the effect of sealing a road can mask its structural condition and present an optimistic picture of the network's load carrying capacity, which degrades continually due to the effects of traffic loading and the environment. The visual condition therefore cannot be relied upon as the definitive measure of the condition of the road network.

A detailed map showing the condition of provincial roads may be viewed on the RNIS internet site at http://rnis.westerncape.gov.za/rnis/kml_jobs_display.draw_map?p_job_id=3 . Photographic and other detail can be accessed for each road segment by clicking on the map.

4.3.3 Visual condition of paved roads per district municipality

Table 4-9 and Figure 4-7 illustrates the paved road visual condition distribution according to the 2019 visual assessment data, per DM, including the UniCity roads. The UniCity roads have the highest percentage of roads in poor and very poor condition, followed by the Cape Winelands DM and Central Karoo DM. These roads require expensive measures for rehabilitation.

Table 4-9: Condition distribution per DM for paved roads in the Western Cape December 2019

DM	Length (km)				
	Very Poor	Poor	Fair	Good	Very Good
City of Cape Town	13	38	35	143	137
Cape Winelands	26	250	688	458	281
Garden Route	10	108	411	442	449
Overberg	9	48	149	318	419
Central Karoo	5	90	165	193	168
West Coast	7	76	270	707	572
UniCity	34	129	108	69	35
Western Cape Province	103	740	1 826	2 331	2 062

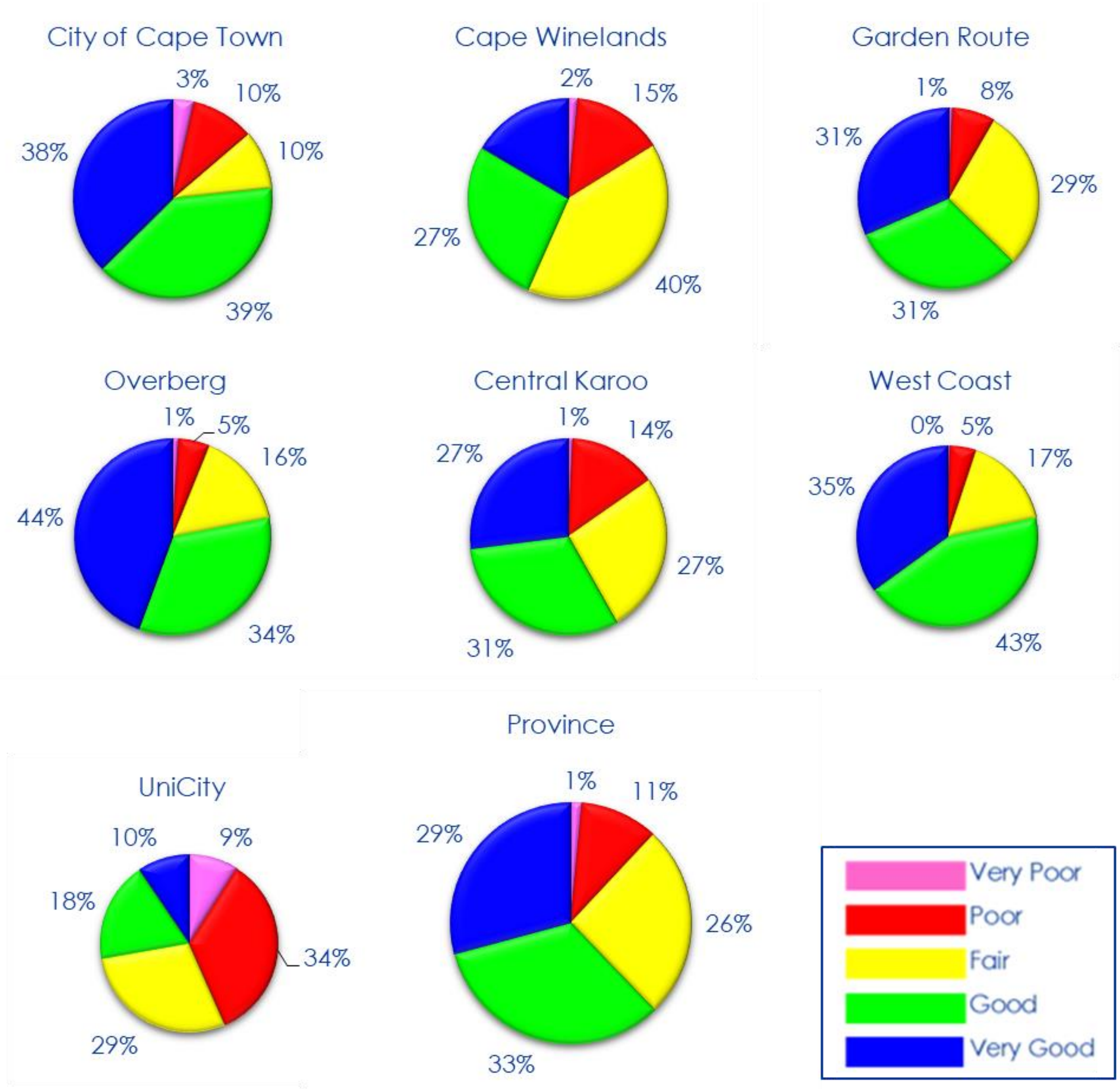


Figure 4-7: Condition distribution per kilometre by DM area for paved roads as at December 2019 including UniCity roads

4.3.4 Visual condition of paved roads per RCAM Class

Table 4-10 and Figure 4-8 illustrates the paved road visual condition distribution according to the 2019 visual assessment data, per RCAM class. Comparing paved roads in the different RCAM classes, it is clear that the higher class roads are maintained to a higher level of service as per the documented desired level of service in Chapter 3.

Table 4-10: Condition distribution per RCAM class for paved roads in the Western Cape December 2019

RCAM Class	Length (km)				
	Very Poor	Poor	Fair	Good	Very Good
1	2	21	21	63	128
2	13	269	684	841	972
3	44	315	680	934	782
4	30	121	415	462	175
5	15	13	25	32	5

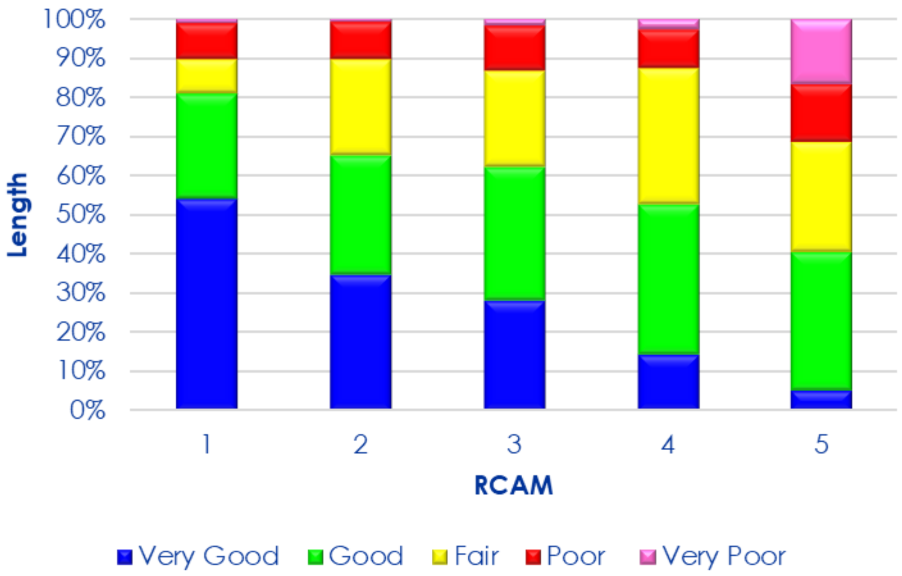


Figure 4-8: Condition distribution per kilometre by RCAM Class for paved roads as at December 2019 including UniCity roads

4.3.5 Instrument survey condition data

Measurements are collected by a high-speed instrument survey and are used for modelling future pavement performance in the lifecycle benefit-cost analysis. These measurements include longitudinal and transverse profiles that are converted to roughness measurements, rut depths, surface texture measurements and deflection measurements. A summary of these measurements is provided in Table 3-1and the results for the paved network are shown for the following:

- Longitudinal profile roughness – Table 4-11;
- Transverse profile rut – Table 4-12;
- Surface texture depth – Table 4-13; and
- Falling weight deflection measurements – Table 4-14.

According to draft TMH 22 (Committee of Transport Officials, 2013), the service level is determined at the 90th percentile level, which represents a considerable change from the 50th percentile used previously. Table 4-11 shows the categories of road in the Western Cape and the service level previously used that was based on TRH 4 categories A, B and C. The use of the 90th percentile level for all categories or RCAM classes does not differentiate between their different requirements for roughness. Therefore, the use of percentiles according to road category and RCAM class is proposed and shown in Table 4-11. A similar approach has been shown in Table 4-12 for transverse profile and in Table 4-13 for surface texture.

Evaluation of measurements

- In terms of roughness (longitudinal profile), all RCAM Class roads do not meet service level requirements. This is a reflection of the age of the current network and the low rate of rehabilitation, please refer to paragraph 4.8.1.
- In terms of rutting from transverse profile measurements, all categories and classes meet service level requirements.
- In terms of surface texture measurements, all categories and classes meet service level requirements.
- In terms of falling weight deflectometer (FWD) measurements, there are no current service levels with which to compare the measurements.
- The condition of the road links, in terms of the various condition indices, per road link is not currently available on the RNIS.
- The condition of the structure assets (bridges, major culverts, etc.), in terms of the various condition indices, per asset type is not currently available.
- The condition of the ancillary components, in terms of the various condition indices, per component is not currently available.

Table 4-11: Longitudinal profiling measurements as at March 2016

Category or RCAM class	Level of service IRI	Actual condition (IRI m/km)			
		Average	Median	%<4,2 m/km	Percentile
1	p97,5<4,20	2,0	1,9	96,9	p97,5 = 4,3
2	p95<4,20	2,8	2,5	88,8	p95 = 5,2
3	p90<4,20	3,1	2,7	84,0	p90 = 4,8
4	p80<4,20	3,7	3,1	71,7	p80 = 4,6
5	p80<4,20	3,7	3,2	71,3	p80 = 4,8

Table 4-12: Transverse profiling rut measurements as at March 2016					
Category or RCAM class	Level of service (average $\bar{x}$) mm	Actual condition (mm)			
		Average $\bar{x}$	Median	%<20 mm	Percentile
1	$\bar{x}$ ≤20	5,4	5,0	99,9	p97,5 = 12
2	$\bar{x}$ ≤20	6,2	5,0	99,0	p95 = 10
3	$\bar{x}$ ≤20	7,0	6,0	97,8	p90 = 12
4	$\bar{x}$ ≤20	7,4	6,0	97,0	p80 = 10
5	$\bar{x}$ ≤20	7,2	6,0	97,3	p80 = 9

Table 4-13: Surface texture measurements as at March 2016					
Category or RCAM class	Level of service (average $\bar{x}$) mm	Actual condition (mm)			
		Average $\bar{x}$	Median	%<0,4 mm	Percentile
1	$\bar{x}$ ≥0,4	1,2	1,3	7,5	p95 = 1,9
2	$\bar{x}$ ≥0,4	1,2	1,2	5,7	p90 = 2,2
3	$\bar{x}$ ≥0,4	1,3	1,2	2,3	p80 = 1,8
4	$\bar{x}$ ≥0,4	1,2	1,1	2,2	p80 = 1,7
5	$\bar{x}$ ≥0,4	1,4	1,3	0,2	p80 = 1,8

Table 4-14: FWD deflection measurements as at March 2016					
Category or RCAM class	Level of service μmm	Actual condition (μmm)			
		Average	Median	%<600 μmm	Percentile
1	Not provided	280	272	97,0	p97,5 = 633
2	Not provided	494	469	70,5	p95 = 934
3	Not provided	503	472	71,0	p90 = 786
4	Not provided	533	487	68,1	p80 = 711
5	Not provided	505	464	70,0	p80 = 661

The data collection of the mechanical surveillance measurements on the paved road network has initiated with a consultant being appointed in the last quarter of 2021/22. The procurement of the data collection services will ensure that the Department complies with the TMH 22 and the PRMG Framework, and it is anticipated that the data collection will be completed over the contractual period.

4.3.6 The visual condition of the unpaved road network

Visual assessment surveys are conducted annually to collect and record condition information on the unpaved road network. The surveys are completed on all maintained[2] unpaved roads. The VCI is based on the visual assessment ratings of all the unpaved road characteristics that are surveyed annually.

Table 4-15 presents examples of some of the characteristics collected during the visual assessment surveys according to draft TMH 9: Manual for Visual Assessment of Road Pavements, Part E: Unpaved Roads (Committee of Transport Officials, 2015). The distresses shown here are those typically modelled in the lifecycle benefit-cost analysis to predict future performance.

Table 4-15: Examples of some results from on the unpaved network surveyed according to draft TMH 9	
Gravel quantity Example of degree 3 rating (Isolated subgrade exposures, 50 – 100 mm).	
Riding quality (roughness) Example of degree 5 rating (estimated comfortable/safe speed < 40 km/h).	
Drainage on the road Example of degree 1 rating (edges of road are at least 300 mm above natural ground level).	

[2] Most of the minor road network is not managed, i.e., they are not maintained using provincial funds.

Table 4-16 shows examples of unpaved road visual conditions.

Table 4-16: Examples of visual condition indices of unpaved roads	
Very Poor condition category	Poor condition category
	
MR00552 (Holrivier)	DR02171 (Aurora - Saamstaan)

The current condition of the 10 350 km of unpaved, maintained roads in the province is shown in Figure 4-9.

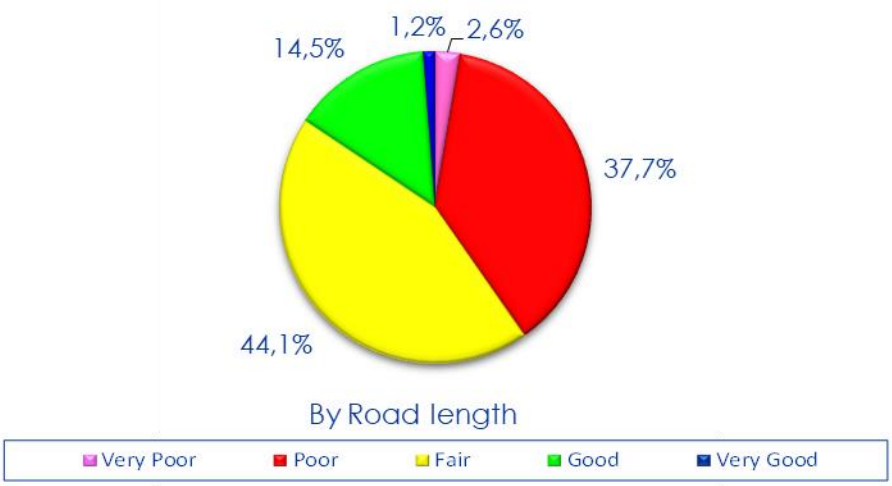


Figure 4-9: The condition of the unpaved road network as at December 2019

The condition distribution of maintained unpaved roads in 2019 is shown in Figure 4-10. The comparison shows consideration is given to the maintenance of unpaved roads carrying the most passengers. By comparison, 25,0% of all passengers' travel on the 40,3% of poor to very poor roads and 23,7% passengers travel on the 15,7% good to very good roads.

The comparison in Figure 4-10 show that the condition distribution per vehicle-kilometre driven is superior to the condition distribution per road length. Further the condition impacting the roads users represented in passenger-kilometres driven shows a further improvement on the condition road users experience.

A detailed map showing the condition of provincial roads may be viewed at http://rnis.westerncape.gov.za/rnis/kml_jobs_display.draw_map?p_job_id=5 . Photographic and other detail can be accessed for each road segment by clicking on the map.

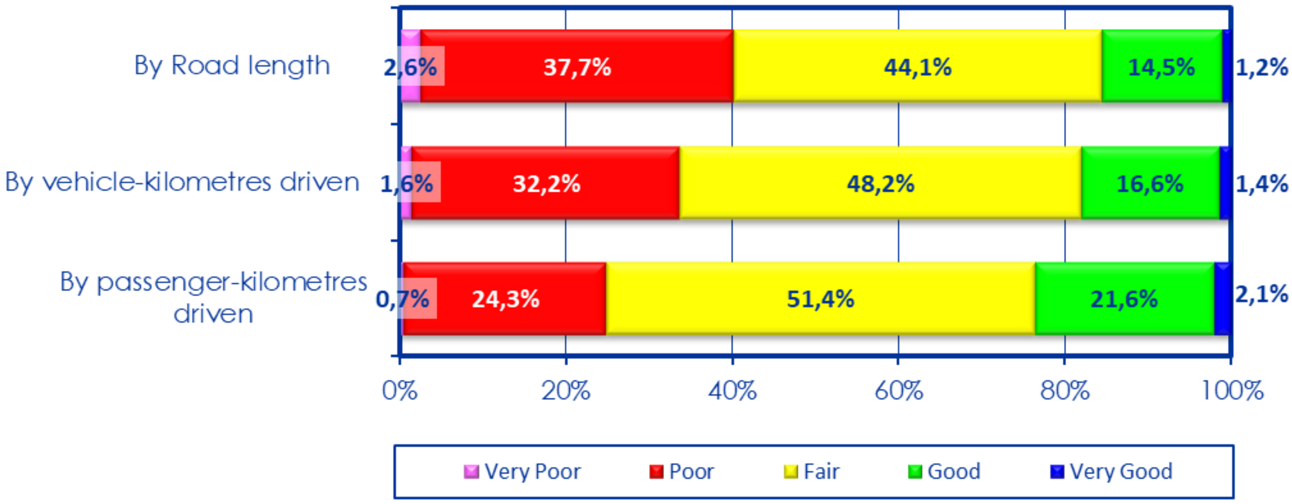


Figure 4-10: Unpaved roads condition distribution by length versus vehicle and passenger-kilometres in Dec. 2019

4.3.7 Visual condition of unpaved roads per district municipality

Table 4-17 provides the unpaved road visual condition distribution according to the 2019 visual assessment data, per DM. The majority of all unpaved roads, irrespective of DM, are in fair to poor condition, as shown in Figure 4-11.

Table 4-17: Condition distribution per DM for unpaved roads in December 2019

DM	Length (km)				
	Very Poor	Poor	Fair	Good	Very Good
City of Cape Town	-	-	-	5	-
Cape Winelands	110	458	592	227	26
Garden Route	37	1 432	1 219	312	6
Overberg	12	439	619	271	18
Central Karoo	37	468	1 353	458	57
West Coast	75	1 101	780	225	15
Western Cape Province	271	3 897	4 563	1 497	122

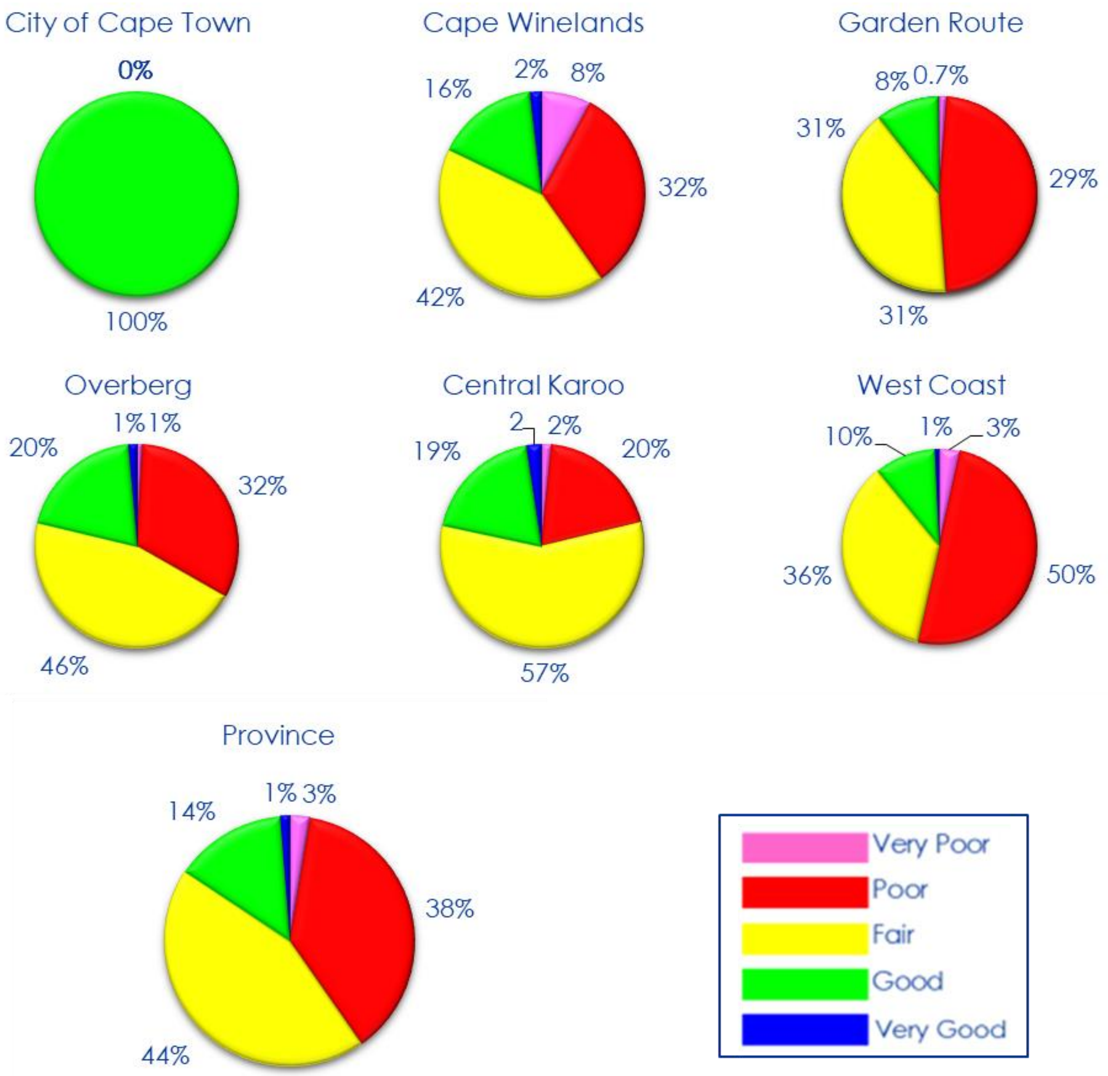


Figure 4-11: Condition distribution per kilometre by DM area for unpaved roads as at December 2019

4.3.8 Visual condition of unpaved roads per RCAM

Table 4-18 provides and Figure 4-12 illustrates the unpaved road visual condition distribution according to the 2019 visual assessment data, per RCAM Class.

Table 4-18: Condition distribution per RCAM class for unpaved roads in the Western Cape December 2019

RCAM Class	Length (km)				
	Very Poor	Poor	Fair	Good	Very Good
1	0	0	0	0	0
2	0	40	71	21	0
3	65	528	731	387	30
4	191	3 163	3 618	1 065	83
5	15	167	144	24	9

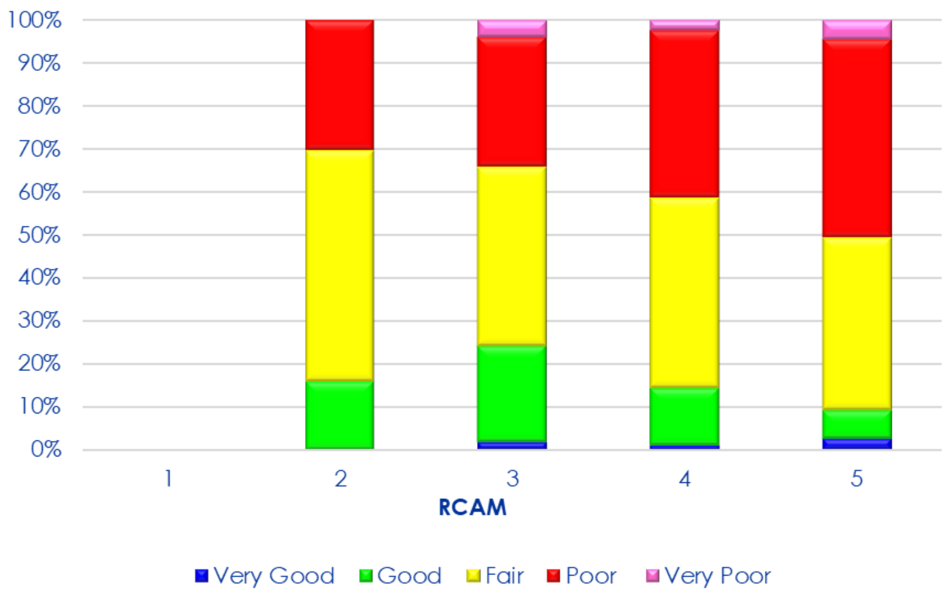


Figure 4-12: Condition distribution per kilometre by RCAM class for unpaved roads as at December 2019

4.3.9 Visual condition indices of Road Structures

The data provided in this section of the report is currently undergoing quality assurance and this chapter will be updated in the Final RAMP 2022/23 submission.

The total number of structures that has been inspected by March 2020 are represented in Table 4-19 by type and district.

Table 4-19: Structures included in the visual condition data per District (March 2020)

	Bridge	Bridge - Arch	Bridge Cellular	Culvert Major	Retaining Wall	Sign Gantry
West Coast	127	1	7	201	1	0
Cape Winelands	199	2	11	434	8	0
Garden Route (Eden)	169	6	21	540	60	0
City of Cape Town (DMC)	102	2	0	36	9	30
Central Karoo	84	0	6	341	0	0
Overberg	100	5	14	214	1	0
Total	781	16	59	1766	79	30

For these structures, the branch calculated an Average Condition Index (ACI) and a Priority Condition Index (PCI). The ACI will be used as a comparative index over time to monitor the overall condition of the bridges. The PCI which is a de-duct-based calculation will be used to identify structures with serious or critical defects that require immediate attention.

Both the ACI and PCI is categorised as very poor (0-30%), poor (30-50%), fair (50-70%), good (70-85%), and very good (85-100%) as shown in Table 4-20.

Table 4-20: Categories of PCI and ACI

VCI range (%)	Description	Colour used in charts & graphs
0 – 29	critical	
30 – 49	poor	
50 – 69	fair	
70 – 84	good	
85 – 100	very good	

The average condition Index per structure type was calculated and the distribution per structure type is shown in Figure 4-13. When using the ACI calculation method the overall ratings of the structures are between fair and very good, however **one** sign gantry is in poor condition. None of the structures has an overall critical rating when the ACI method of calculation is used.

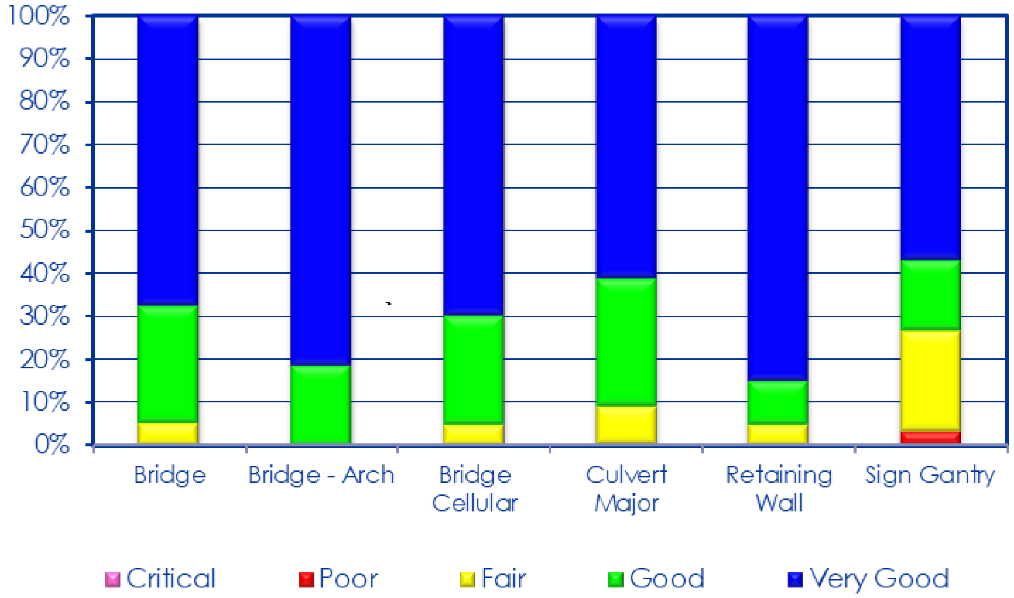


Figure 4-13: ACI for all structures per structure type

Priority Condition Index per structure type was calculated and the distribution per structure type is shown in Figure 4-14. When using the PCI calculation there are 22 bridges, 1 arch bridge, 1 cellular bridge, 46 major culverts and 1 retaining wall with an immediate urgent need for attention.

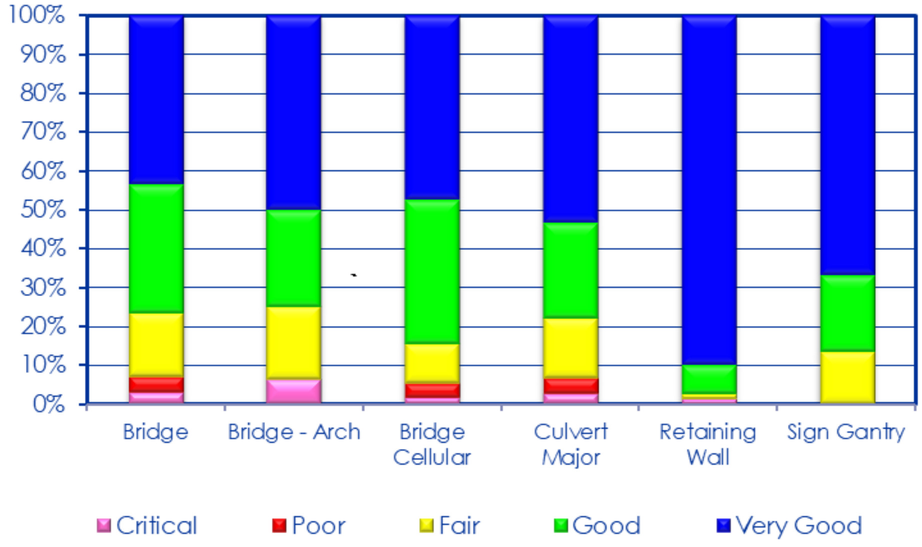


Figure 4-14: PCI for all structures per structure type

4.3.10 Average condition index of Road Structures per district

Bridges

Table 4-21 provides the bridges average condition distribution according to the latest structure data collection (March 2020), per DM. All bridges, irrespective of DM, are in fair to very good condition, as shown in Figure 4-15.

Table 4-21: Average condition distribution per DM for bridges (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	10	36	56
Cape Winelands	0	0	12	59	128
Garden Route (Eden)	0	0	3	44	122
Overberg	0	0	9	20	71
Central Karoo	0	0	5	31	48
West Coast	0	0	2	25	100
Western Cape Province	0	0	41	215	525

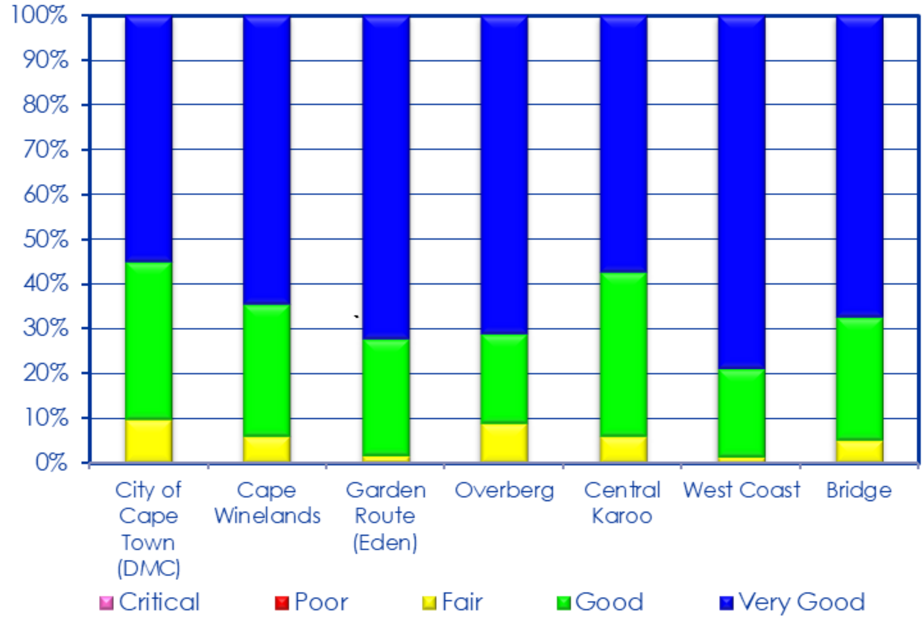


Figure 4-15: ACI for bridges per DM (March 2020)

Arch Bridges

Table 4-22 provides the arch bridges average condition distribution according to the latest structure data collection (March 2020), per DM. All the arch bridges, irrespective of DM, are in fair to very good condition, as shown in Figure 4-16.

Table 4-22: Average condition distribution per DM for arch bridges (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	0	0	2
Cape Winelands	0	0	0	2	0
Garden Route (Eden)	0	0	0	0	6
Overberg	0	0	0	1	4
Central Karoo	0	0	0	0	0
West Coast	0	0	0	0	1
Western Cape Province	0	0	0	3	13

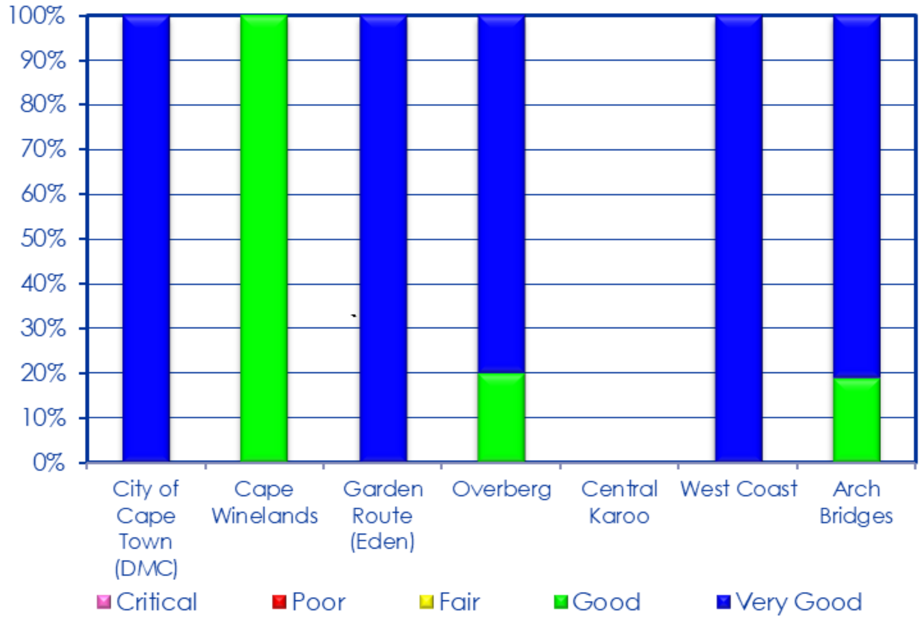


Figure 4-16: ACI for arch bridges per DM (March 2020)

Cellular Bridges

Table 4-23 provides the cellular bridges average condition distribution according to the latest structure data collection (March 2020), per DM. All the cellular bridges, irrespective of DM, are in fair to very good condition, as shown in Figure 4-17.

Table 4-23: Average condition distribution per DM for cellular bridges (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	0	0	0
Cape Winelands	0	0	2	2	7
Garden Route (Eden)	0	0	1	2	18
Overberg	0	0	0	4	10
Central Karoo	0	0	0	4	2
West Coast	0	0	0	3	4
Western Cape Province	0	0	3	15	41

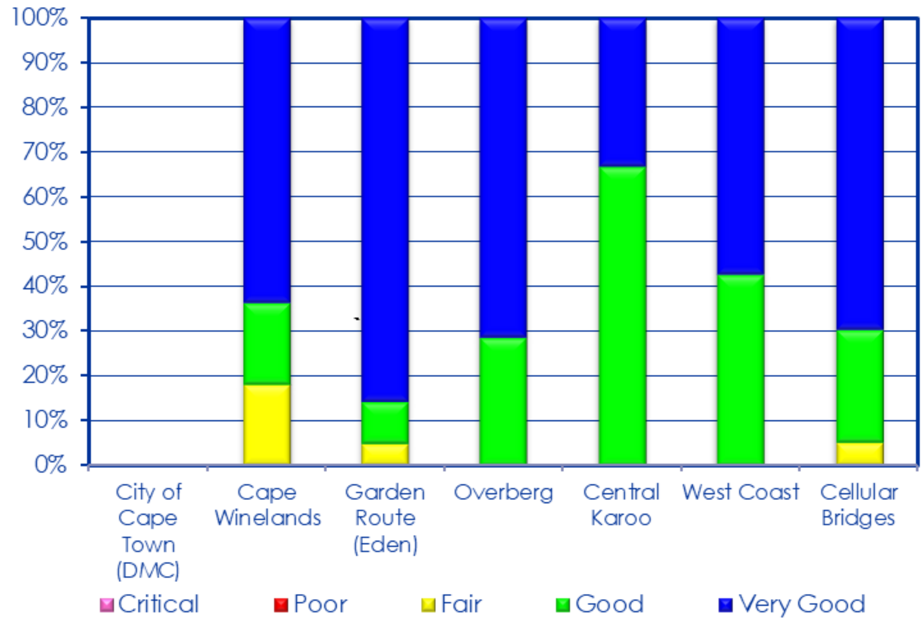


Figure 4-17: ACI for cellular bridges per DM (March 2020)

Major Culverts

Table 4-24 provides the major culverts average condition distribution according to the latest structure data collection (March 2020), per DM. Most of the major culverts, irrespective of DM, are in fair to very good condition, as shown in Figure 4-18. There are six major culverts in poor condition.

Table 4-24: Average condition distribution per DM for major culverts (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	1	2	33
Cape Winelands	0	0	40	127	267
Garden Route (Eden)	0	2	51	167	320
Overberg	0	2	15	77	120
Central Karoo	0	0	33	113	195
West Coast	0	2	20	38	141
Western Cape Province	0	6	160	524	1076

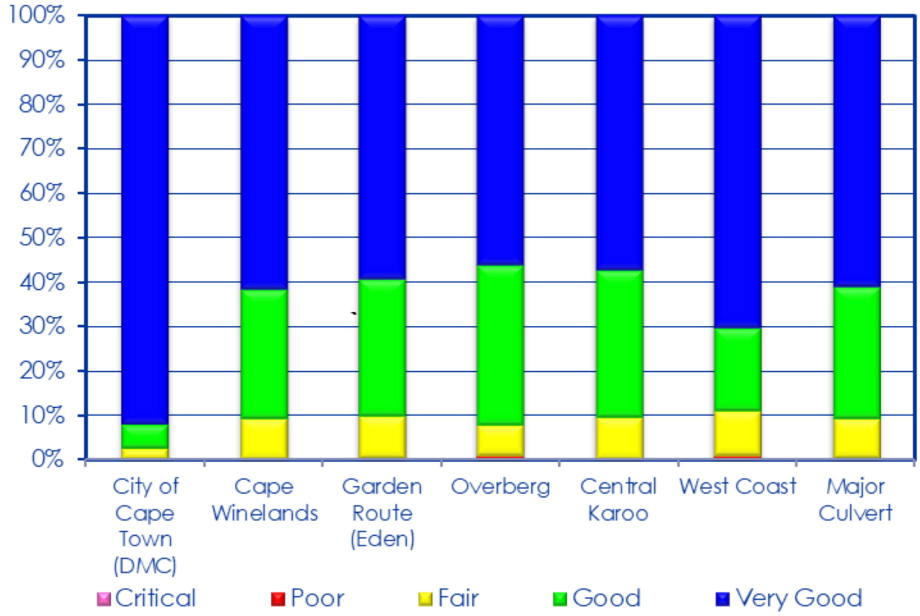


Figure 4-18: ACI for major culverts per DM (March 2020)

Retaining Walls

Table 4-25 provides the retaining walls average condition distribution according to the latest structure data collection (March 2020), per DM. All the retaining walls, irrespective of DM, are in fair to very good condition, as shown in Figure 4-19.

Table 4-25: Average condition distribution per DM for retaining walls (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	1	0	8
Cape Winelands	0	0	0	1	7
Garden Route (Eden)	0	0	3	6	51
Overberg	0	0	0	1	0
Central Karoo	0	0	0	0	0
West Coast	0	0	0	0	1
Western Cape Province	0	0	4	8	67

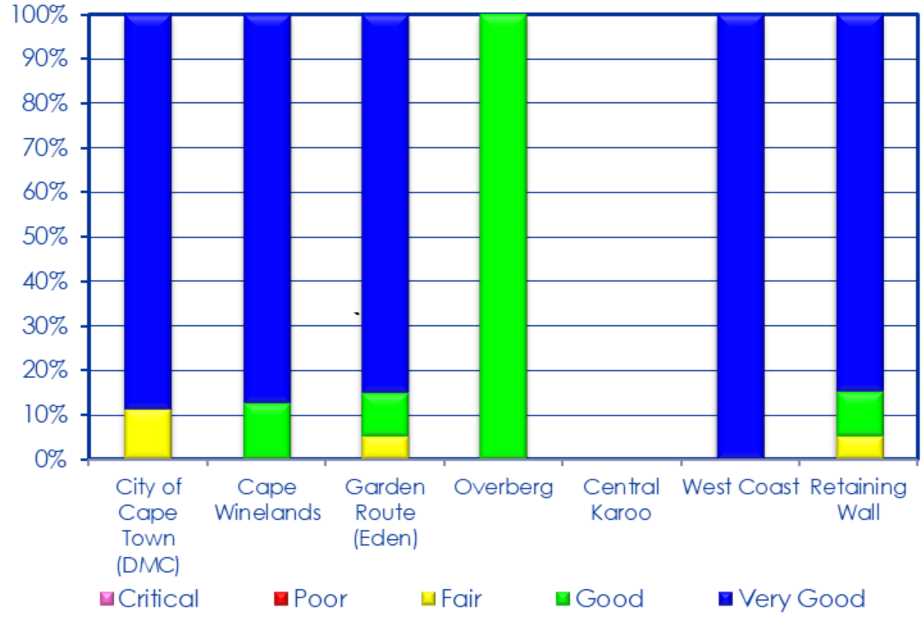


Figure 4-19: ACI for retaining walls per DM (March 2020)

Sign Gantries

Table 4-26 provides the sign gantries average condition distribution according to the latest structure data collection (March 2020), per DM. The only DM that has condition data for the sign gantries is City of Cape Town. One of the sign gantries are in poor condition and the others are in fair to very good condition, as shown in Figure 4-20.

Table 4-26: Average condition distribution per DM for sign gantries (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	1	7	5	17
Cape Winelands	0	0	0	0	0
Garden Route (Eden)	0	0	0	0	0
Overberg	0	0	0	0	0
Central Karoo	0	0	0	0	0
West Coast	0	0	0	0	0
Western Cape Province	0	1	7	5	17

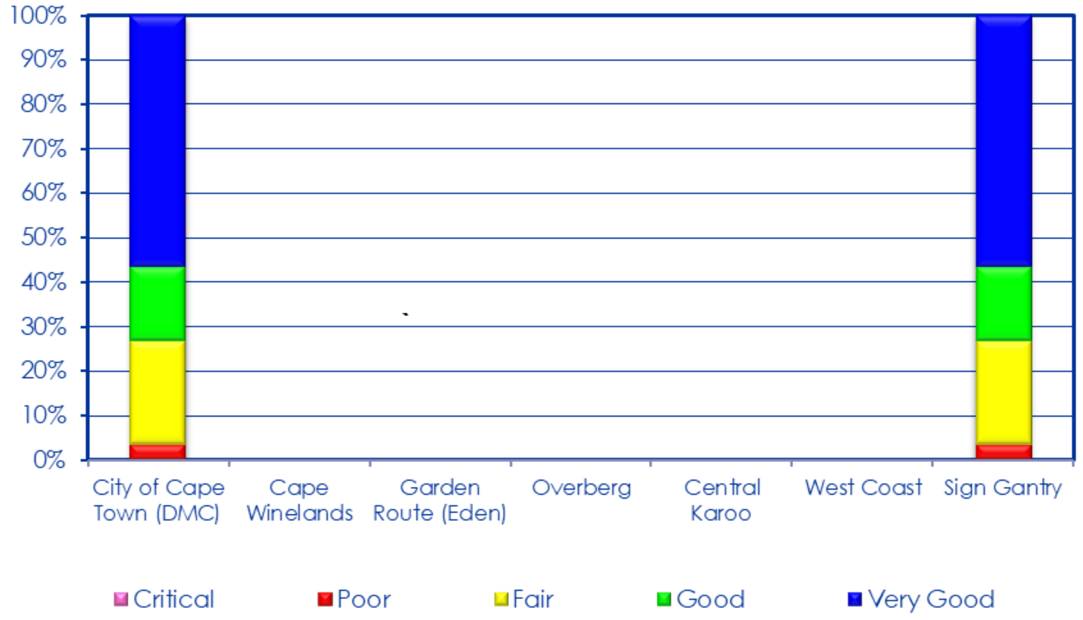


Figure 4-20: ACI for sign gantries per DM (March 2020)

4.3.11 Priority condition index of Road Structures per district

Bridges

Table 4-27 provides the bridges priority condition distribution according to the latest structure data collection (March 2020), per DM. The only DM that does not have a bridge in critical condition is the West Coast, all other DM's have bridges with an immediate treatment need, as shown in Figure 4-21.

Table 4-27: Priority condition distribution per DM for bridges (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	6	9	22	34	31
Cape Winelands	8	10	46	59	76
Garden Route (Eden)	1	4	13	50	101
Overberg	5	4	17	32	42
Central Karoo	2	1	15	34	32
West Coast	0	3	16	51	57
Western Cape Province	22	31	129	260	339

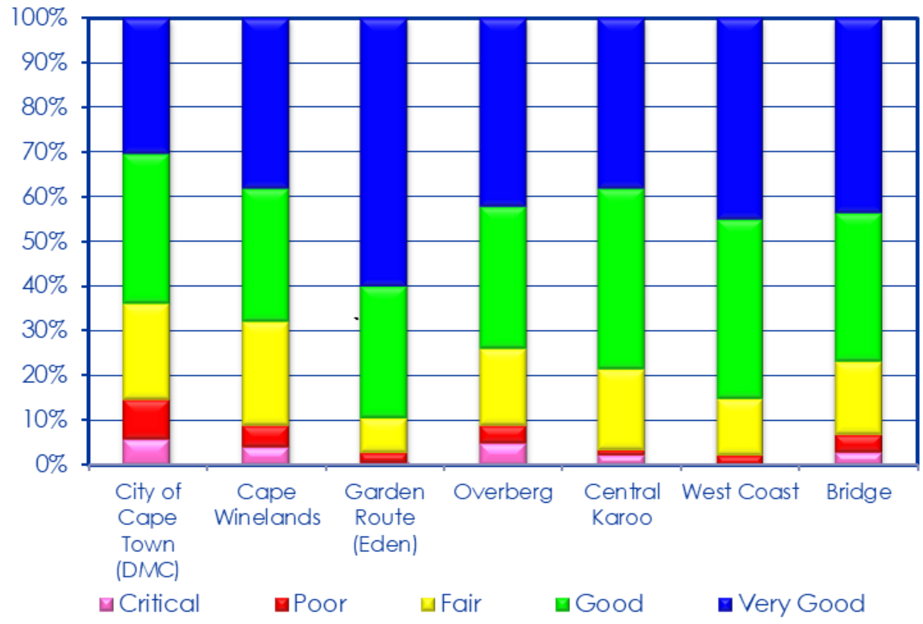


Figure 4-21: PCI for bridges per DM (March 2020)

Arch Bridges

Table 4-28 provides the arch bridges priority condition distribution according to the latest structure data collection (March 2020), per DM. The West Coast DM has an arch bridge with an urgent maintenance need. All the other arch bridges, irrespective of DM, are in fair to very good condition, as shown in Figure 4-22.

Table 4-28: Priority condition distribution per DM for arch bridges (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	0	1	1
Cape Winelands	0	0	1	1	0
Garden Route (Eden)	0	0	1	0	5
Overberg	0	0	1	2	2
Central Karoo	0	0	0	0	0
West Coast	1	0	0	0	0
Western Cape Province	1	0	3	4	8

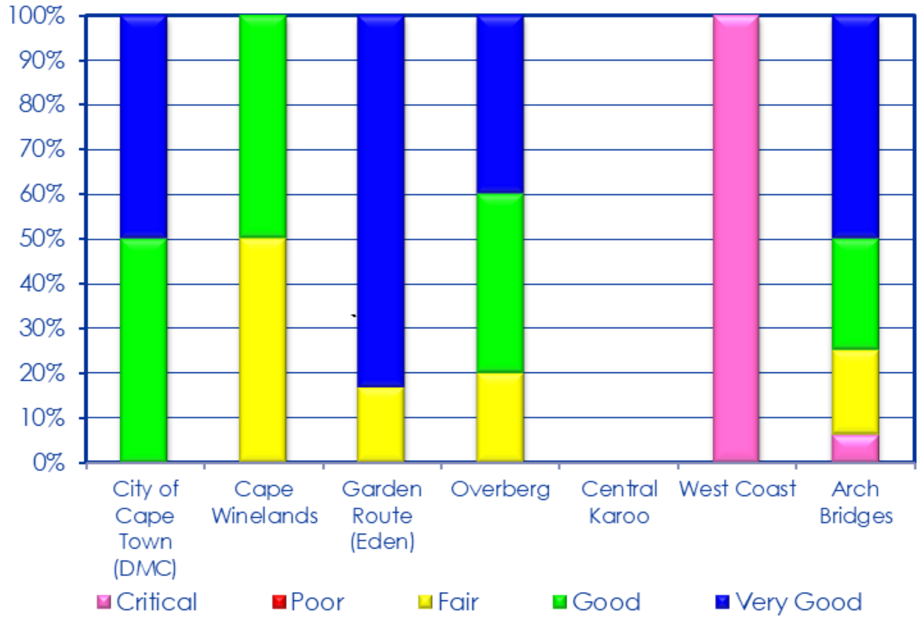


Figure 4-22: PCI for arch bridges per DM (March 2020)

Cellular Bridges

Table 4-29 provides the cellular bridges priority condition distribution according to the latest structure data collection (March 2020), per DM. The Overberg DM has a cellular bridge with an urgent maintenance need, Cape Winelands and the Garden Route DM's each has a bridge with a poor priority index indicating a maintenance need. All the other cellular bridges, irrespective of DM, are in fair to very good condition, as shown in Figure 4-23.

Table 4-29: Priority condition distribution per DM for cellular bridges (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	0	0	0
Cape Winelands	0	1	2	4	4
Garden Route (Eden)	0	1	2	4	14
Overberg	1	0	1	5	7
Central Karoo	0	0	0	5	1
West Coast	0	0	1	4	2
Western Cape Province	1	2	6	22	28

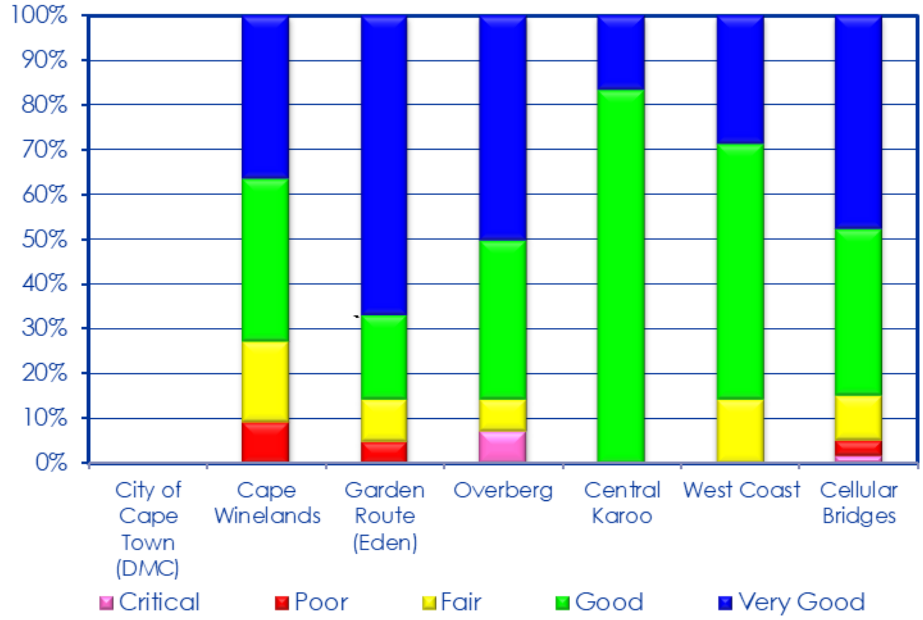


Figure 4-23: PCI for cellular bridges per DM (March 2020)

Major Culverts

Table 4-30 provides the major culverts priority condition distribution according to the latest structure data collection (March 2020), per DM. Most of DM major culverts in critical and poor condition, which requires maintenance of some kind, as shown in Figure 4-24.

Table 4-30: Priority condition distribution per DM for major culverts (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	1	0	4	6	25
Cape Winelands	10	21	58	119	226
Garden Route (Eden)	12	22	79	142	285
Overberg	8	7	30	55	114
Central Karoo	11	16	76	65	173
West Coast	4	3	28	46	120
Western Cape Province	46	69	275	433	943

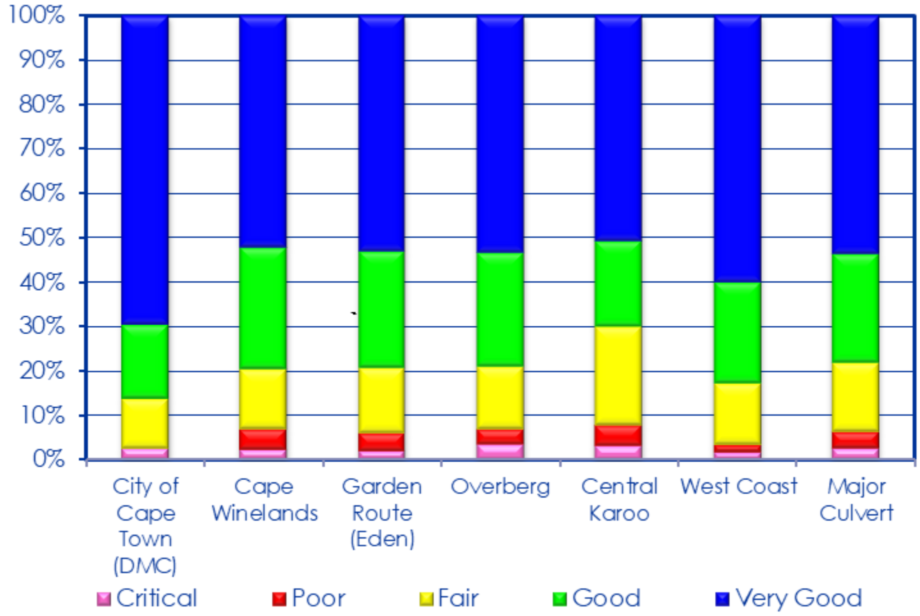


Figure 4-24: PCI for major culverts per DM (March 2020)

Retaining Walls

Table 4-31 provides the retaining walls priority condition distribution according to the latest structure data collection (March 2020), per DM. In the Cape Winelands DM there is one retaining wall in critical condition, requiring urgent maintenance, all other retaining wall, irrespective of DM, are in fair to very good condition, as shown in Figure 4-25.

Table 4-31: Priority condition distribution per DM for retaining walls (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	0	1	8
Cape Winelands	1	0	0	0	7
Garden Route (Eden)	0	0	1	4	55
Overberg	0	0	0	1	0
Central Karoo	0	0	0	0	0
West Coast	0	0	0	0	1
Western Cape Province	1	0	1	6	71

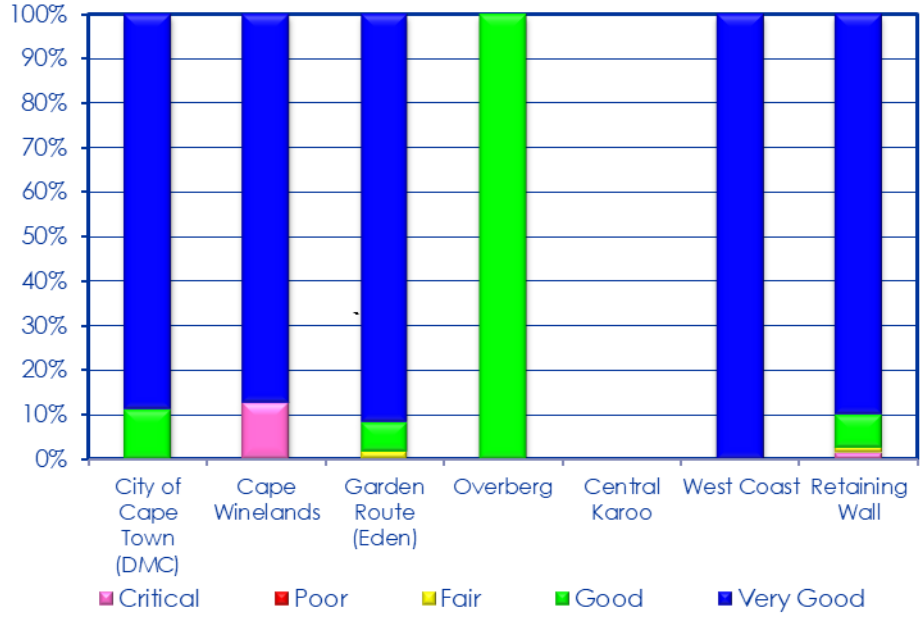


Figure 4-25: PCI for retaining walls per DM (March 2020)

Sign Gantries

Table 4-32 provides the sign gantries priority condition distribution according to the latest structure data collection (March 2020), per DM. The only DM that has condition data for the sign gantries is City of Cape Town. All the sign gantries are in fair to very good condition, as shown in Figure 4-26.

Table 4-32: Priority condition distribution per DM for retaining walls (March 2020)

DM	Length (km)				
	Critical	Poor	Fair	Good	Very Good
City of Cape Town (DMC)	0	0	4	6	20
Cape Winelands	0	0	0	0	0
Garden Route (Eden)	0	0	0	0	0
Overberg	0	0	0	0	0
Central Karoo	0	0	0	0	0
West Coast	0	0	0	0	0
Western Cape Province	0	0	4	6	20

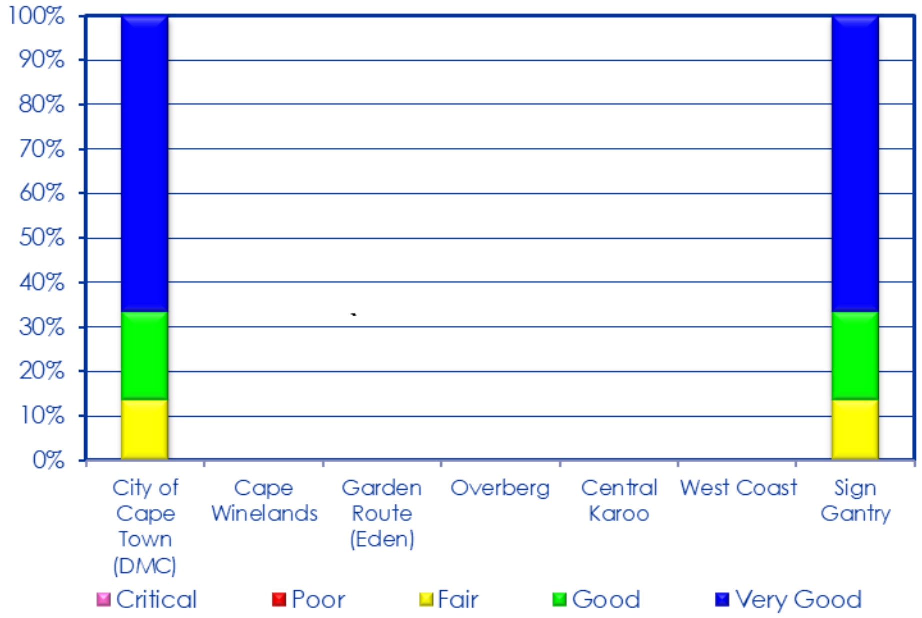


Figure 4-26: PCI for sign gantry per DM (March 2020)

4.3.12 Condition of road markings

The condition of road markings is shown in Table 4-33 and Figure 4-27, which highlights the poor and very poor conditions that are found mostly on class 3 and 4 roads.

Table 4-33: Condition of road markings according to RCAM class June 2020

Condition	RCAM class									
	1		2		3		4		5	
	Km	%	Km	%	Km	%	Km	%	Km	%
Very Good	0,00	0,0%	597,11	8,7%	323,17	4,7%	146,83	2,1%	8,92	0,1%
Good	125,69	1,8%	1336,58	19,4%	1258,41	18,3%	422,68	6,2%	12,02	0,2%
Fair	51,37	0,7%	657,79	9,6%	748,72	10,9%	437,44	6,4%	16,20	0,2%
Poor	2,00	0,0%	63,67	0,9%	160,68	2,3%	112,23	1,6%	2,47	0,0%
Very Poor	0,00	0,0%	6,43	0,1%	16,74	0,2%	18,35	0,3%	0,38	0,0%
None	0,00	0,0%	93,68	1,4%	47,48	0,7%	197,19	2,9%	8,42	0,1%

NOTES:

- Excludes UniCity Roads

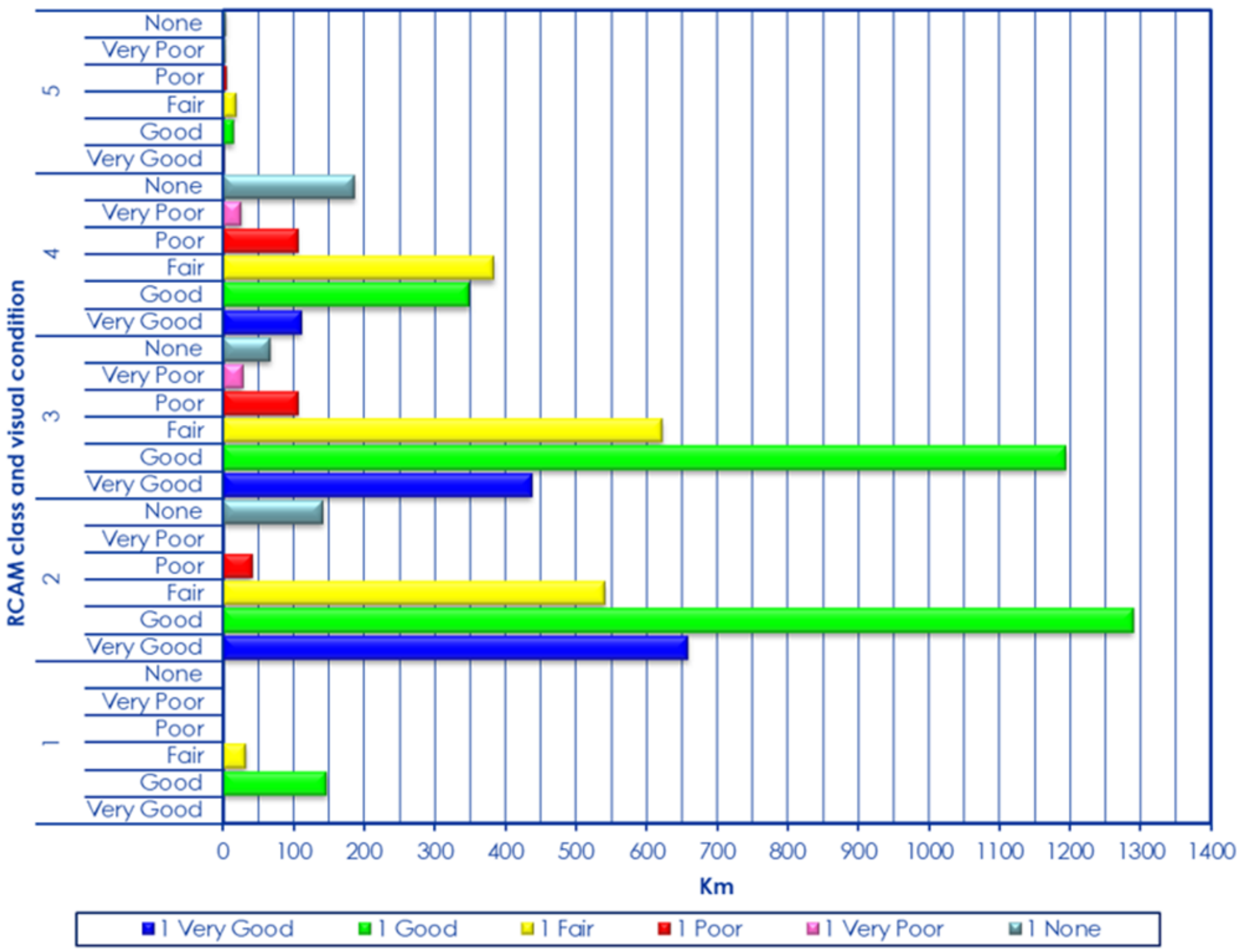


Figure 4-27: Condition of road markings according to RCAM class in June 2020

4.3.13 Condition of Plant equipment

In Figure 4-28 the current condition distribution of the different plant equipment is shown, some of the equipment's condition is unknown. Most equipment is in good to excellent condition. For the equipment in poor condition a replacement/maintenance strategy will be implement or be removed from the asset register if the equipment is not used.

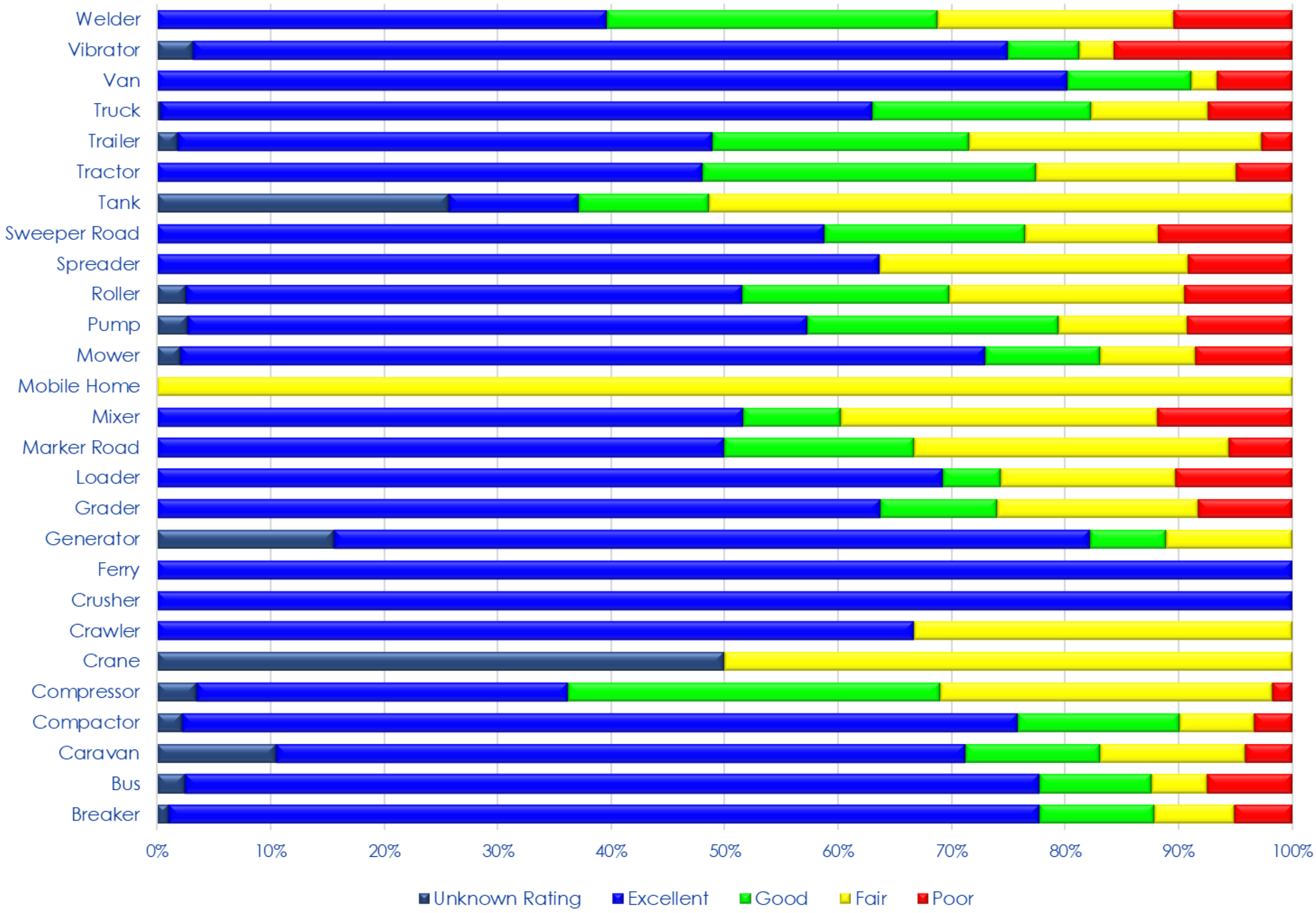


Figure 4-28: Condition distribution of the plant equipment

4.4 Functional condition of the assets

4.4.1 General

According to the THM 22 document, there are four functional indices related to road asset management systems. The four functional indices are:

- Capacity
- Riding Quality
- Road Safety
- Availability

In the compliance statement as provided in Appendix B, the Branch states that it will first aim to complete the work required for a Level II RAMS, on all asset under the management of the Branch. For a Level II RAMS, the only functional indices required is capacity and riding quality FI calculations.

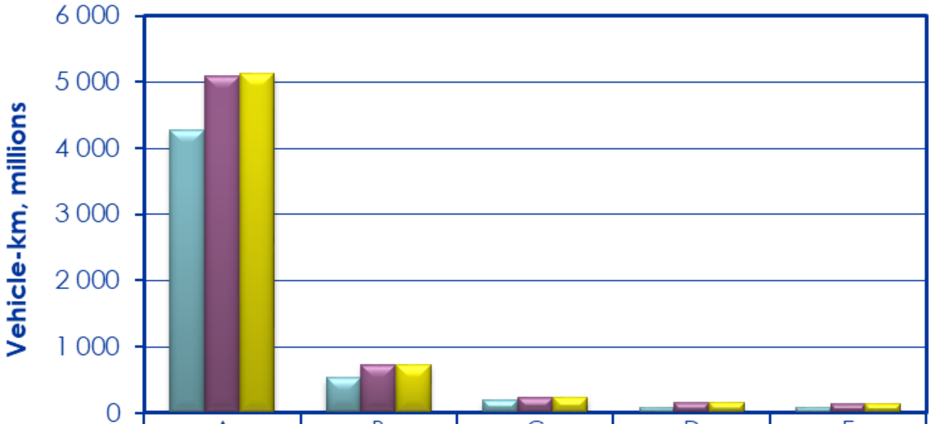
In addition to these indices, the branch has evaluated the following functional condition assessments:

- Riding quality and Smooth Travel Exposure
- Skid resistance
- Macro texture (MPD) and High Texture Exposure
- Low Rut Exposure.

4.4.2 Volume capacity

Level of service

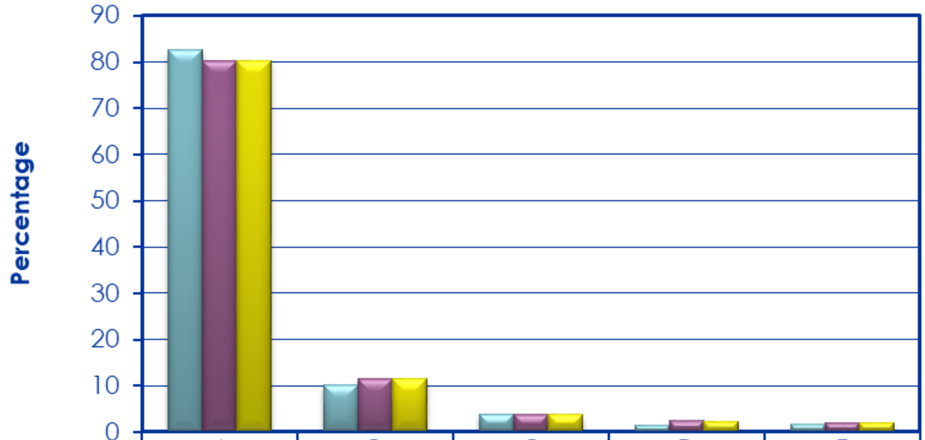
The quality of traffic flow is measured in terms of level of service (LOS). On provincial paved roads, the LOS varies from LOS A, indicating free flow conditions, to LOS E, indicating full capacity conditions with queuing being experienced. Normally the Branch strives to provide at least LOS B on rural roads and LOS D on urban roads. Figure 4-29 shows the distribution of vehicle-km travelled annually on roads under the control of the Branch currently experiencing LOS C, D or E. Figure 4-30 shows the distribution of vehicle-km as a percentage of the total in terms of LOS. Although the total of vehicle-km has grown in the last decade, the distribution remains almost constant. Only about 8% of the vehicle-km experience a LOS of C or lower.



	A	B	C	D	E
2005	4271,88	530,28	201,32	80,46	90,69
2017	5082,46	730,35	237,94	153,73	133,56
2019	5131,08	729,93	239,24	151,53	132,98

Level of Service

Figure 4-29: Vehicle-km travelled annually for each level of service category in 2005, 2017 and 2019 (excludes UniCity roads)



	A	B	C	D	E
2005	82,55	10,25	3,89	1,55	1,75
2017	80,19	11,52	3,75	2,43	2,11
2019	80,36	11,43	3,75	2,37	2,08

Level of Service

Figure 4-30: Percentage vehicle-km travelled for each level of service category in 2005, 2017 and 2019 (excludes UniCity roads)

It must, however, be stressed that LOS in terms of volume capacity is only relevant when LOS D or E is reached on a road. Roads constructed to the correct geometric design class will provide LOS A or B for many years.

Apart from paved road upgrading projects, capacity is not normally a reason for improving a road unless it can be economically justified. Unpaved roads are upgraded to paved roads mainly due to traffic volumes that are too high for economic maintenance, and/or to improve road user costs and riding quality. Except for the 8% of vehicle-km mentioned above, the network performs well and provides LOS B or better.

Volume capacity ratio

Volume-to-capacity ratio (v/c) is the primary performance measure for the highway-based critical segments. V/C is a conventional level-of-service measure for roadways, comparing roadway demand (vehicle volumes) with roadway supply (carrying capacity). This measure can alert the branch to areas where traffic mitigation measures should be considered. The capacity volume ratio's (V/C) is shown per pavement type and RCAM class in Figure 4-31 and Figure 4-32.

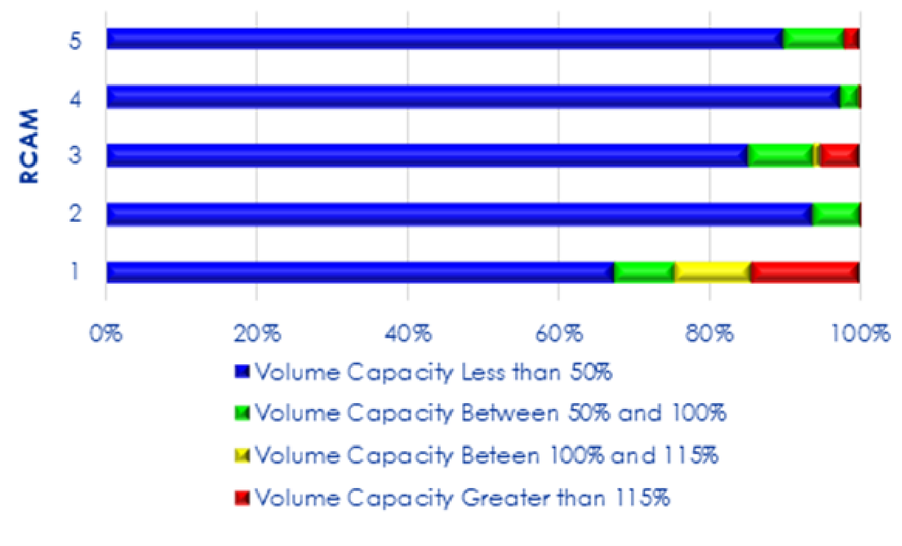


Figure 4-31: Volume capacity ratio for paved roads

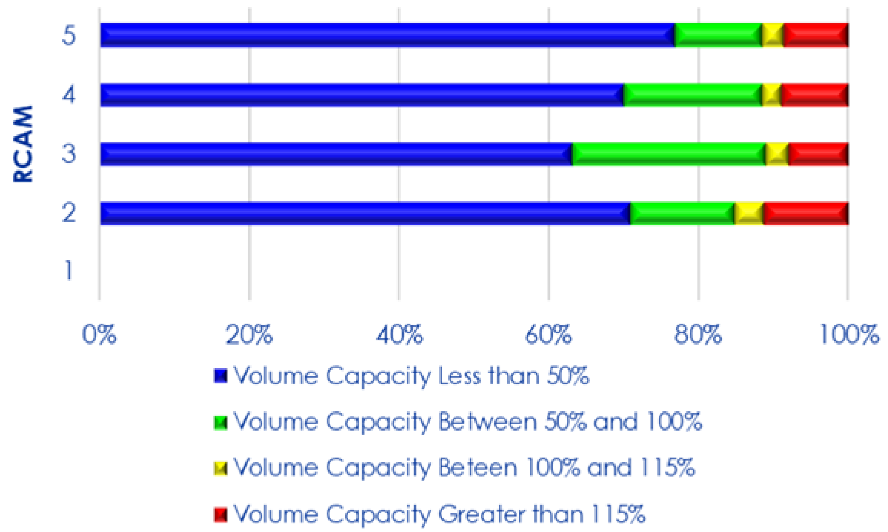


Figure 4-32: Volume capacity ratio for unpaved roads

Function Index based on Volume Capacity Ratio

The V/C is translated to a Functional Index for V/C ($FI_{V/C}$) using the formula provided in TMH 22, shown in Figure 4-33. The branch currently has a volume capacity problem on 8% of the overall road network.

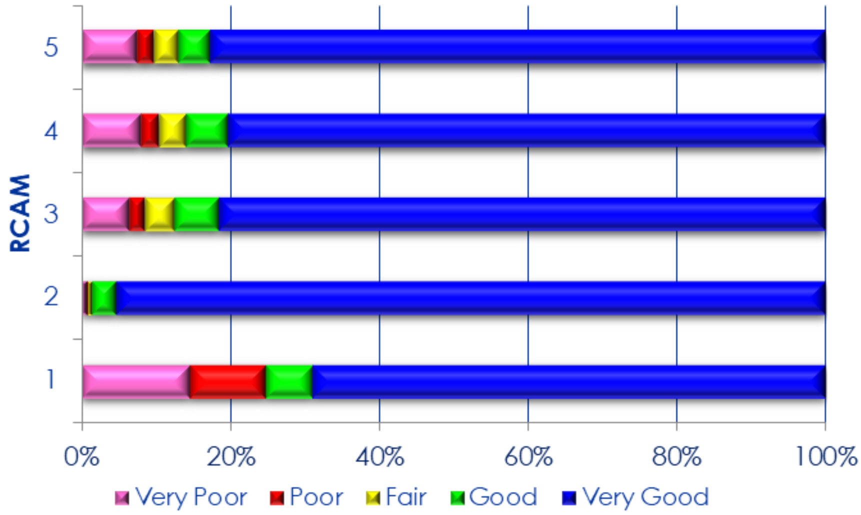


Figure 4-33: $FI_{V/C}$ for all roads

Capacity delay cost

Cost of capacity delays are calculated on all roads related to the impact of the V/C of the roads and time lost related to speed reduction because of congestion caused by the capacity delays. The total capacity delay cost for the road users on the network is R 425 million per annum. Table 4-34 shows the cost of the different pavement types and RCAM class per annum.

Table 4-34: Cost of capacity delays on roads per RCAM class and pavement type (R Million)

Description	RCAM Class				
	1	2	3	4	5
Paved	140,7	29,2	189,5	2,1	0,4
Unpaved	-	0,8	15,9	45,4	1,5

4.4.3 Riding Quality Functional Index

Table 4-35 provides the functional index for roughness per RCAM class. Currently suitable levels of service have not been determined for the functional index for roughness.

Table 4-35: Functional index for roughness

Description	RCAM Class				
	1	2	3	4	5
Average Functional Index	88,3	80,0	74,3	67,4	63,1
Level of service	-	-	-	-	-

The distribution graphs of the functional index related to IRI is shown in Figure 4-34.

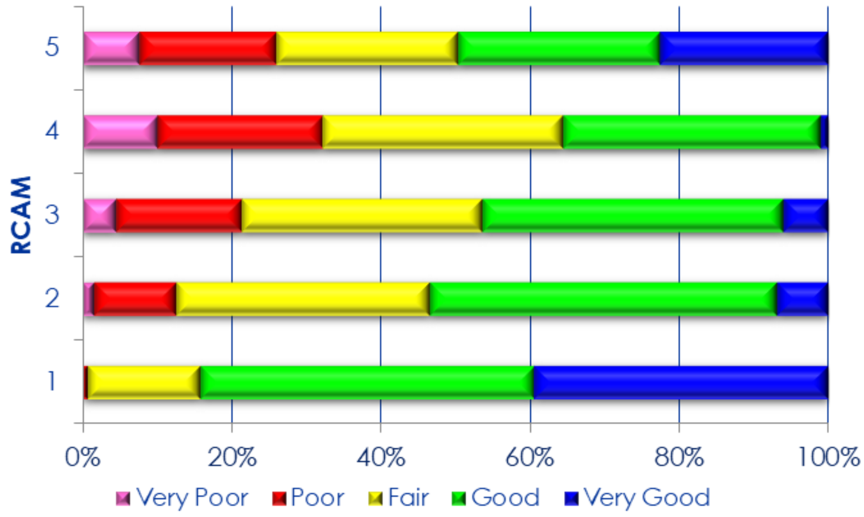


Figure 4-34: FI_{IRI} for paved roads

4.4.4 Smooth Travel Exposure

Smooth travel exposure (STE) measures the technical efficiency of road system performance. It is the proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads. The target condition is IRI ≤ 4,2 (South African Road Agency SOC Ltd, 2016). The purpose is to monitor whether roads are providing acceptable travel conditions. STE is calculated as follows:

$$STE = Vkt \times 100/Vk$$

Where:

Vkt = daily travel measured in vehicle-km on roads classified as above targeted conditions.

Vk = daily travel measured in vehicle-km

The smooth travel exposure statistics per RCAM class are shown in Table 4-36 and Figure 4-35.

Table 4-36: Smooth travel exposure per RCAM class for 2018

Description	RCAM Class				
	1	2	3	4	5
Smooth travel exposure (%)	96,6	90,3	76,5	76,1	64,8
Level of service (minimum, %) (preliminary)	97,5	95,0	90,0	80,0	80,0

Examining the results in Table 4-36, all the RCAM classes indicate less than satisfactory travel conditions with respect to smoothness. This is a reflection of the age of the current network and the low rate of rehabilitation of these old roads. However, the preliminary LOS may have been set too high for these RCAM classes considering the resources available and many roads that fall into RCAM classes 3, 4 and 5 may not be economically viable to rehabilitate. Further investigation into the preliminary LOS target values is therefore required.

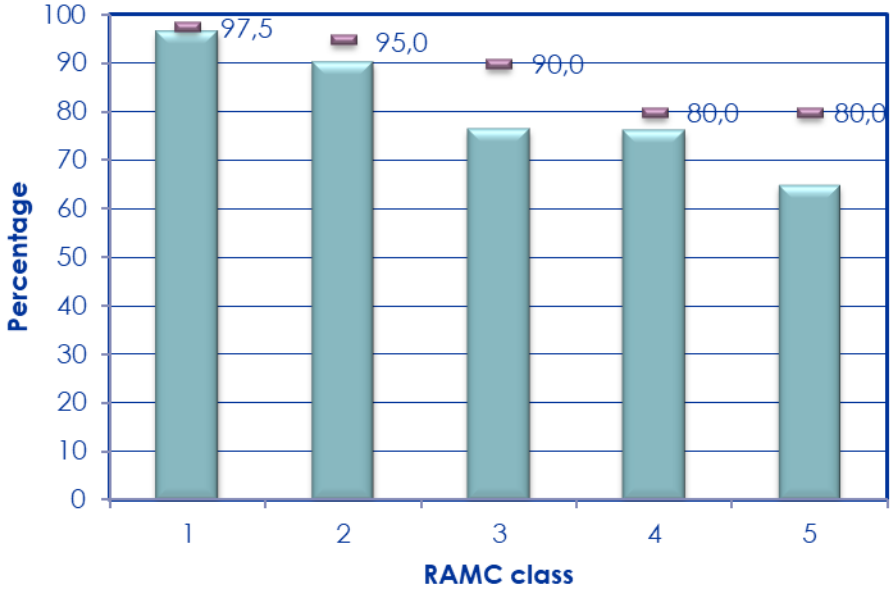


Figure 4-35: Smooth travel exposure per RCAM class compared with preliminary LOS targets for 2018

4.4.5 Low rut exposure

Low rut exposure (LRE) measures the safety efficiency of road system performance. It is the proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads. The target condition is rut depth ≤ 20 mm (Committee of Transport Officials, 2013). The purpose is to monitor whether roads are providing acceptable safety conditions. LRE is calculated as follows:

$$LRE = Vkt \times 100/Vk$$

Where:

Vkt = daily travel measured in vehicle-km on roads classified as above targeted conditions.

Vk = daily travel measured in vehicle-km

The low rut exposure statistics per RCAM class are shown in Table 4-37 and Figure 4-36.

Table 4-37: Low rut exposure per RCAM class for 2018

Description	RCAM Class				
	1	2	3	4	5
Low Rut Exposure (%)	99,8	99,3	97,4	97,3	95,5
Level of service (minimum, %) (preliminary)	97,5	95,0	90,0	80,0	80,0

The results in Table 4-37 indicates acceptable safety conditions for all RCAM classes with respect to pooling of water in ruts that could lead to aquaplaning of light vehicles. The preliminary LOS may be too low for RCAM classes 4 and 5 and further investigation into the preliminary LOS standards needs to be concluded.

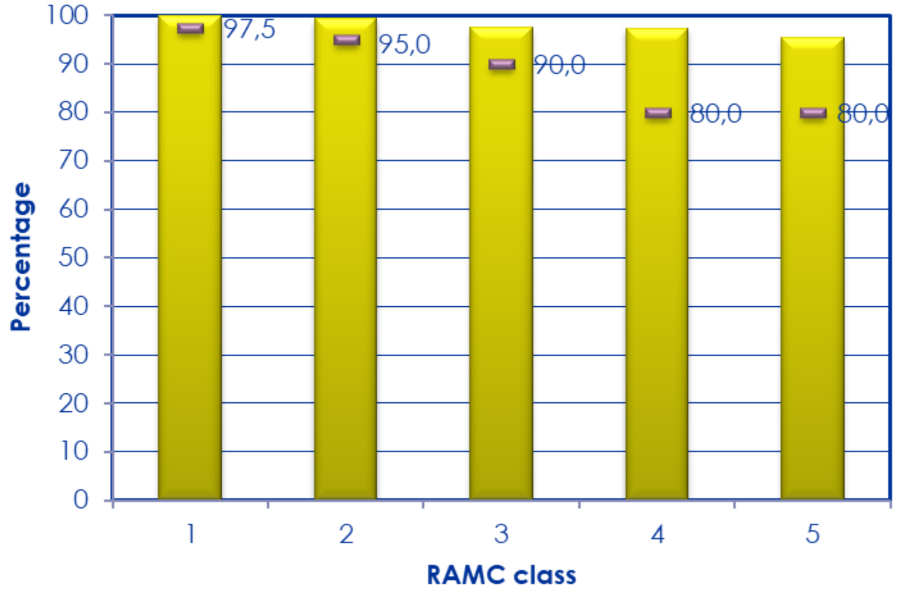


Figure 4-36: Low rut exposure per RCAM class compared with preliminary LOS targets for 2018

4.4.6 High texture exposure

High texture exposure (HTE) measures the safety efficiency of road system performance. It is the proportion of travel undertaken each year on roads with conditions above the targeted conditions for those roads. The target condition is texture depth ≥0,4 mm (Committee of Transport Officials, 2013). The purpose is to monitor whether roads are providing acceptable safety conditions. HTE is calculated as follows:

$$HTE = Vkt \times 100/Vk$$

Where:

Vkt = daily travel measured in vehicle-km on roads classified as above targeted conditions.

Vk = daily travel measured in vehicle-km

The high texture exposure statistics per RCAM class are shown in Table 4-38 and Figure 4-37.

Table 4-38: High texture exposure per RCAM class for 2018

Description	RCAM Class				
	1	2	3	4	5
High texture exposure (%)	87,2	62,0	80,7	88,7	97,3
Level of service (minimum, %) (preliminary)	97,5	95,0	90,0	80,0	80,0

Examining the results in Table 4-38 indicates a less than satisfactory high texture exposure for RCAM classes 1, 2 and 3. This is a reflection of the age of the seals on these roads and that some of the RCAM class 1 and 2 roads are surfaced with asphalt. To date, the target macro texture condition of 0,4 mm has not been used as a reason to reseal these roads. Further investigation into the preliminary LOS standards needs to be done to validate their appropriateness.

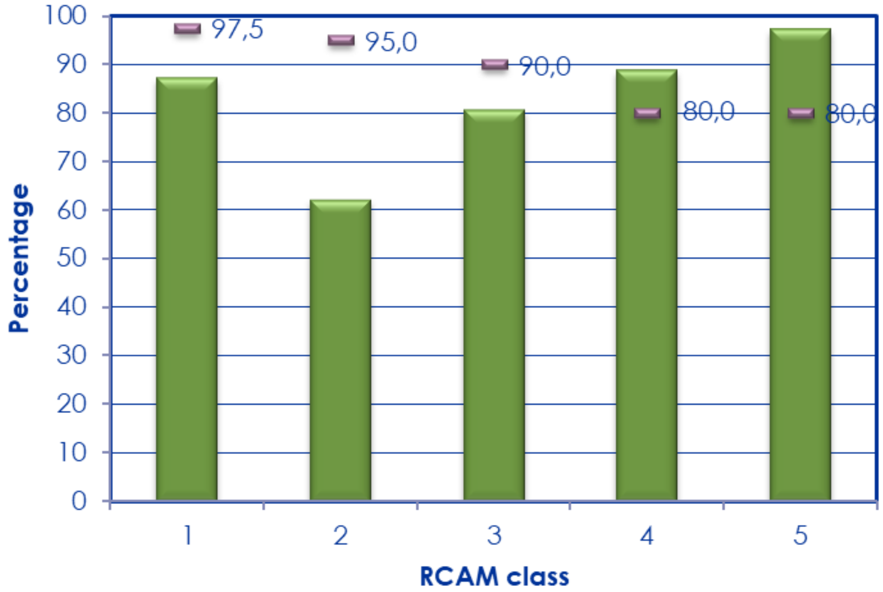


Figure 4-37: High texture exposure per RCAM class compared with preliminary LOS targets in 2018

4.5 Comparative conditions

Figure 4-38 provides a graphical view on the defects on the paved road network. Binder Condition, Crocodile Cracks and Rutting is the predominant defects followed by potholes, patching and edge break. These defects are the major contributors to visual condition of the network.

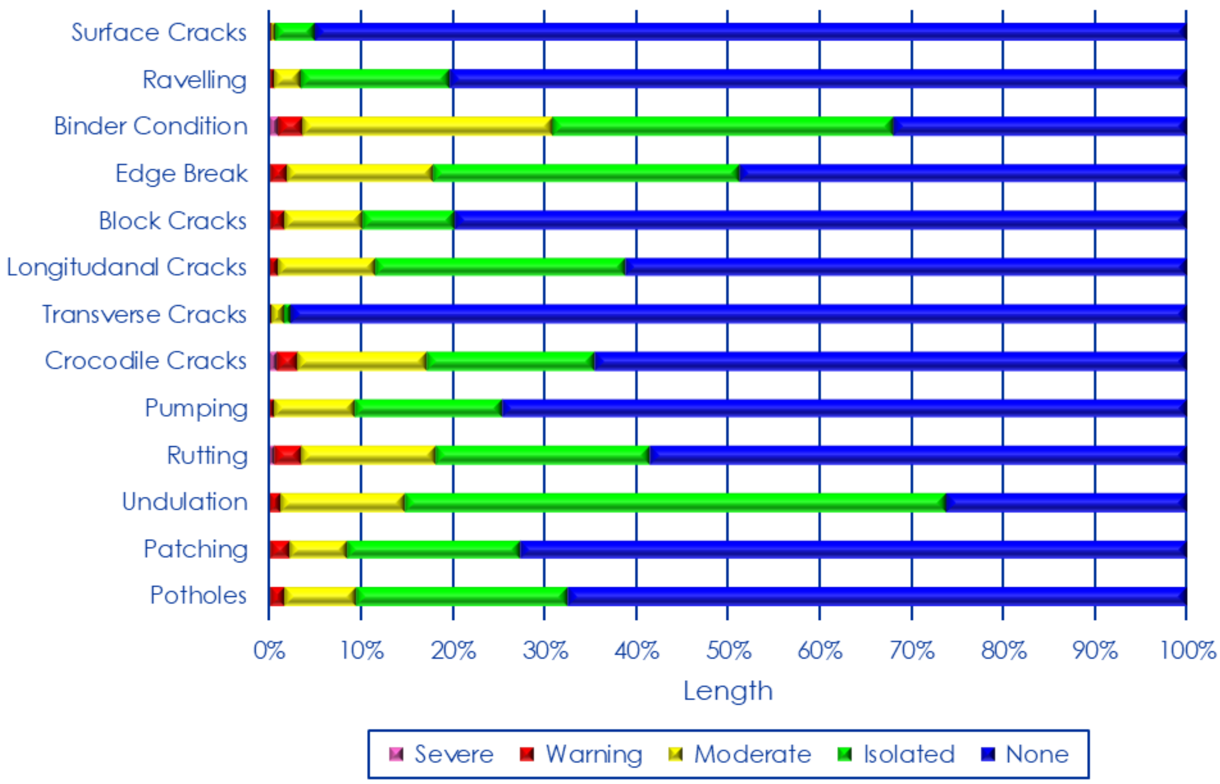


Figure 4-38: Condition distribution per distress for paved roads as at December 2019

Figure 4-39 provides a graphical view on the distresses on the unpaved network. Gravel Thickness is the major cause for concern on the unpaved road network, as more than 70% of the network is functioning with no gravel. The shortage of material availability and approval of borrow pits is the main reason for the lack of gravel material on the network. Additional to the gravel thickness, fixed stoniness is the predominant distresses followed by dust and corrugations. These three defects are the major contributors to roughness on the network.

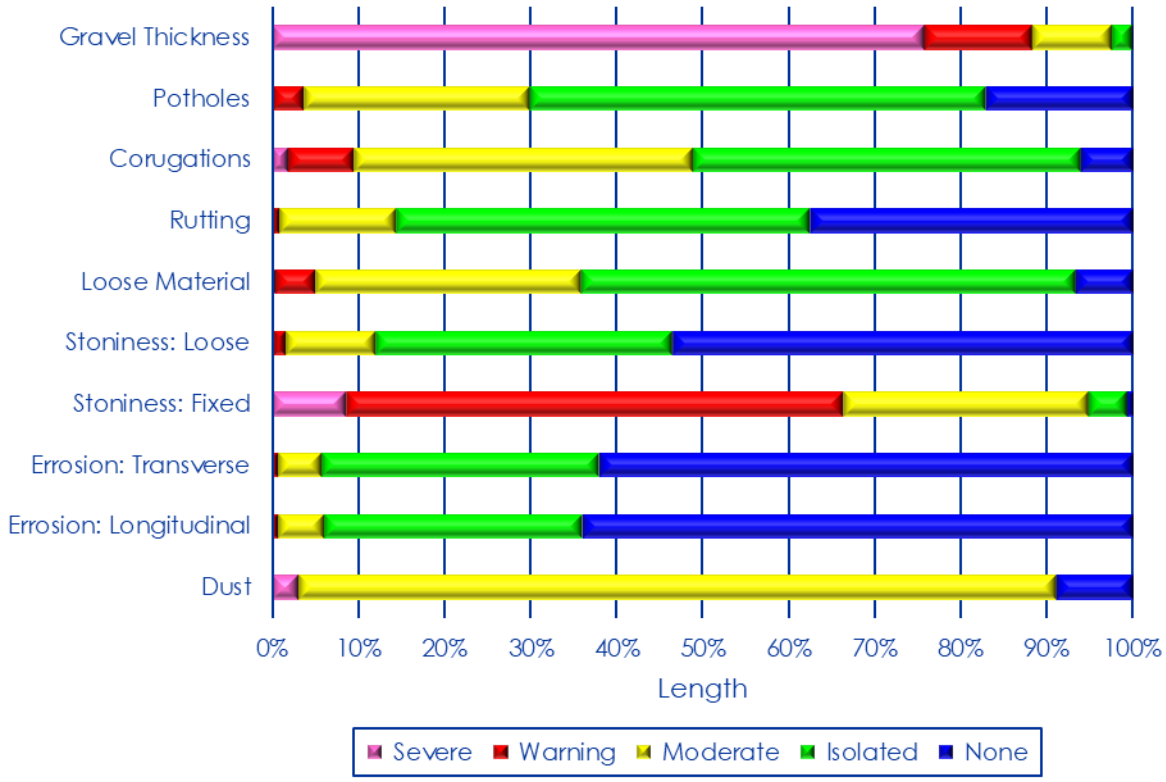


Figure 4-39: Condition distribution of the distresses on the unpaved road network as at December 2019

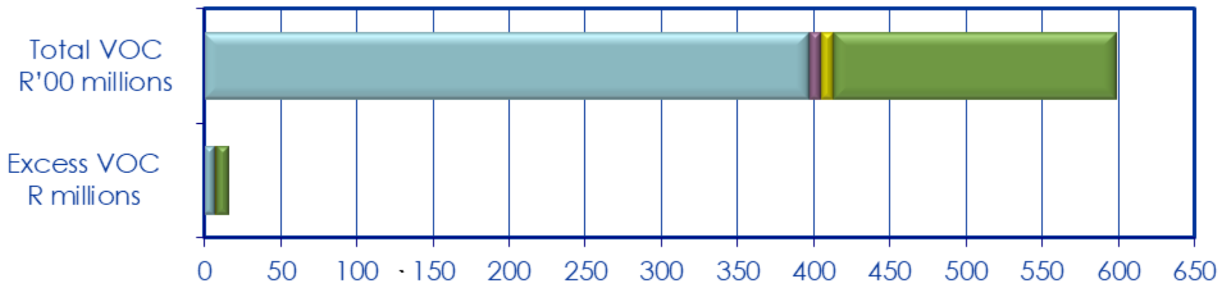
4.6 Vehicle operating costs and excess user costs

Vehicle operating costs are calculated in the Vehicle Operating Cost System (VOCS). The Branch maintains VOCS to update the vehicle operating costs and is accessed at https://rnis.westerncape.gov.za under General Reports: VOC Report. Excess (unnecessary) user costs are defined as the extra vehicle operating costs (VOC) incurred by vehicles travelling on roads rougher than an IRI of 3,1 (International Roughness Index).

Total and excess VOC are shown for the paved network in Table 4-39 and Figure 4-40.

Table 4-39: Calculated vehicle operating cost for the paved road network for 2020

Vehicle operating cost	Length km	Cost per year (Rand, million)				
		Light	Taxis	Buses	Heavy	Total
VOC for R1	236	11 224	179	183	3 401	14 988
Excess for R1	2,00	0,06	0,00	0,00	0,13	0,19
VOC for R2	2 779	16 290	305	333	9 895	26 823
Excess for R2	327,21	3,31	0,04	0,18	3,95	7,48
VOC for R3	2 756	10 378	198	295	4 358	15 230
Excess for R3	442,91	3,33	0,03	0,19	2,58	6,13
VOC for R4	1 203	1 556	30	52	835	2 473
Excess for R4	308,15	0,81	0,02	0,07	0,77	1,67
VOC for R5	89	271	13	16	113	413
Excess for R5	37,75	0,47	0,06	0,04	0,56	1,14
Total	**7 063**	**39 720**	**726**	**879**	**18 602**	**59 927**
Excess	**1 118,02**	**7,98**	**0,15**	**0,48**	**7,99**	**16,60**
Excess as a % of Total VOC %		**0,02**	**0,02**	**0,06**	**0,04**	**0,03**



	Excess VOC R millions	Total VOC R'00 millions
Light	8	397
Taxis	0	7
Buses	0	9
Heavy	8	186

Figure 4-40: Total and excess vehicle operating costs on paved roads for 2020

4.7 Asset valuation

4.7.1 Current and depreciated costs of assets

The rate of change in asset value is a measure of how well the network is being preserved. The value of a new road is made up of:

- The cost of the ground preparation work; and
- The cost of the road structure (i.e., pavement layers, etc.).

The cost of acquiring land can be excluded because it is typically transferred from one owner to the next and therefore does not influence the asset value.

Figure 4-41 shows the components of the asset value of a road. Asset value is calculated as the total value of a road (foundations, preparation works and structural layers), minus the depreciation of the structural layers. The depreciation of the structural layers of a road is calculated in proportion to its remaining life and total life expectancy. This concept is similar to the generally accepted accounting practice of calculating an asset's "book value" which equates to cost minus accumulated depreciation.

Using the method for asset value calculation, the current replacement cost (maximum theoretical asset value) is calculated assuming all the unpaved roads have optimal gravel material thicknesses and all paved roads are newly built.

The asset values for 2020, excluding bridges and other structures, are shown below:

- The current replacement cost is approximately R 179 814 million;
- The depreciated replacement cost is R 141 769 million;
- The depreciated replacement cost is 79% of the current replacement cost, indicating asset consumption of 21%; and
- Paved roads comprise 96% of the current replacement cost.

By comparison, the depreciated replacement cost of the provincial road network, as assessed in 2014, was R75 700 million.

Limitation

The asset values for bridges and other structures have not been determined due to a lack of data.

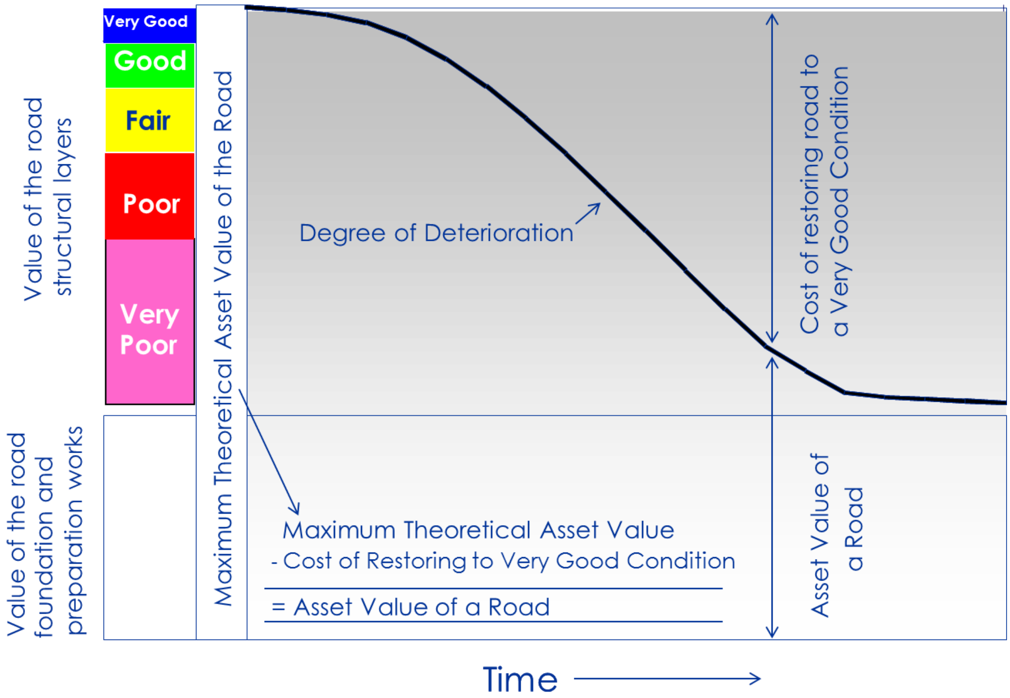


Figure 4-41: Components of the asset value of a road

The current replacement and depreciated replacement costs of the paved and unpaved road network are illustrated in Figure 4-42.

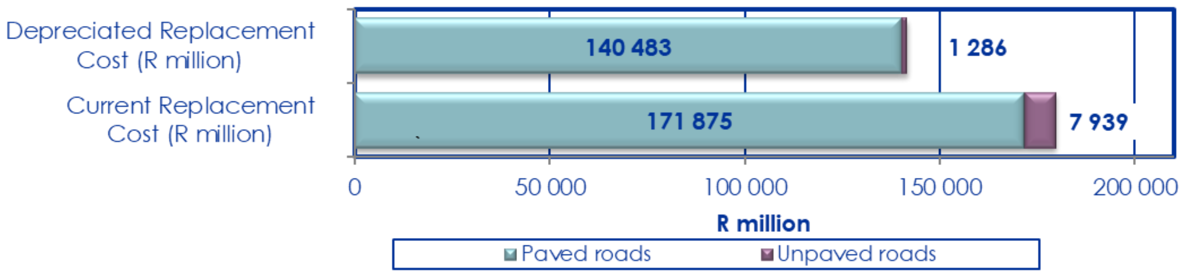


Figure 4-42: Current replacement and depreciated replacement costs of the road network in 2020

The branch envisions that the current data collected on the bridges will later be used to calculate the asset values on bridges as already done for the paved and unpaved roads.

4.8 Remaining useful life of assets

The branch has made the decision to use the methodology to calculate the asset values as shown in Chapter 4.7. However, the age of these assets is still used in the need's analysis conducted for the roads. The branch also keeps a close eye on the age of assets related to the design life of these assets.

4.8.1 Pavement ages

Figure 4-43 shows the distribution of pavement ages for the paved road network of the WCG. A very large proportion (73%, 5 142,94 km) of paved roads is older than the standard design life of 25 years. As a large number of the roads have already reached the end of their design life, a rising trend of paved roads exceeding roughness standards is expected. This will result in a much greater demand for funds for rehabilitation, particularly for Trunk roads, than the current level of funding would be able to accommodate.

Figure 4-44 presents the age distribution of paved roads.

Limitation: Age data is unavailable for 20% of paved roads (1 623,1 km of the network). It is generally accepted that most of these pavements are at least 25 years old and therefore the average network age distribution was adopted for these roads.

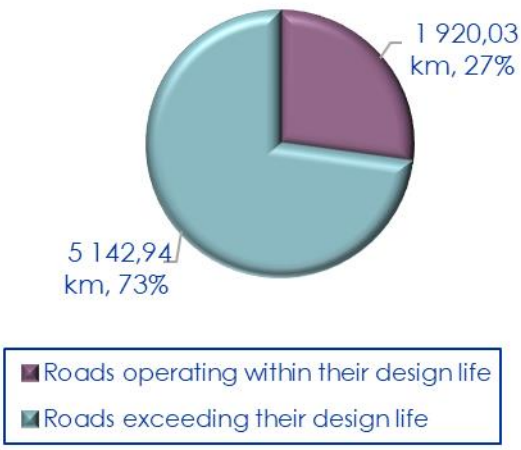


Figure 4-43: Pavement ages versus design life in 2019

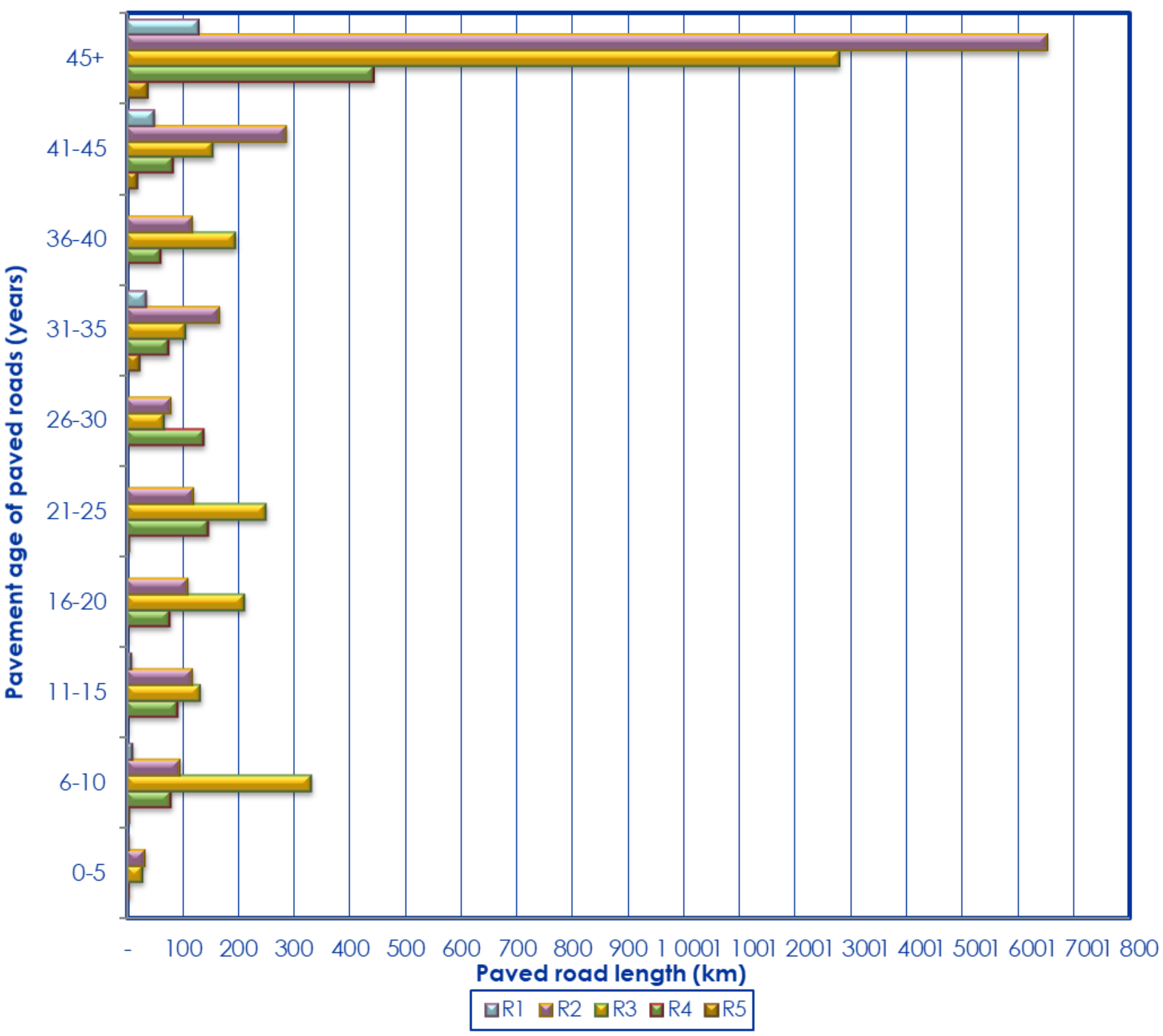


Figure 4-44: Distribution of pavement ages for paved roads 2019

For any road network, a reasonably uniform distribution of pavement ages is desirable to ensure a steady demand for future funding for reconstruction and rehabilitation. Using the available and adapted data on pavement ages, the following can be inferred:

- The vast majority (73%, 5 142,94 km) of pavement ages are older than 25 years, and thus only 27% of the pavements are still operating within their design life.
- Figure 4-44 shows that the R2 class roads has a large number of roads within the 45 years and older category.
- The RNIS data shows the overall rate of reconstruction and rehabilitation since 1984 is generally below 100 km per year (Figure 4-45). Investigating the data, the years 2004, 2007, 2012, 2013, 2015, 2016 and are exceptions when 116 km, 143 km, 121 km, 103 km, 191 km, 118km and 133 km of road were rehabilitated respectively.
- The average rate of rehabilitation of paved roads and upgrades to paved standards over the last 5 years (2014 to 2019) was approximately 107 km per year. In total, approximately 998 km of paved roads were rehabilitated over the last 10 years. The rehabilitation average is therefore roughly 1,4% per year, giving a total of 14% of the total network length over the last 10 years.
- The trend line shows the dip in rehabilitation in the mid-90s and the higher rate in the period 2005 to 2019. Extra funding may have contributed to the higher rate of rehabilitation in the years 2010 to 2019.

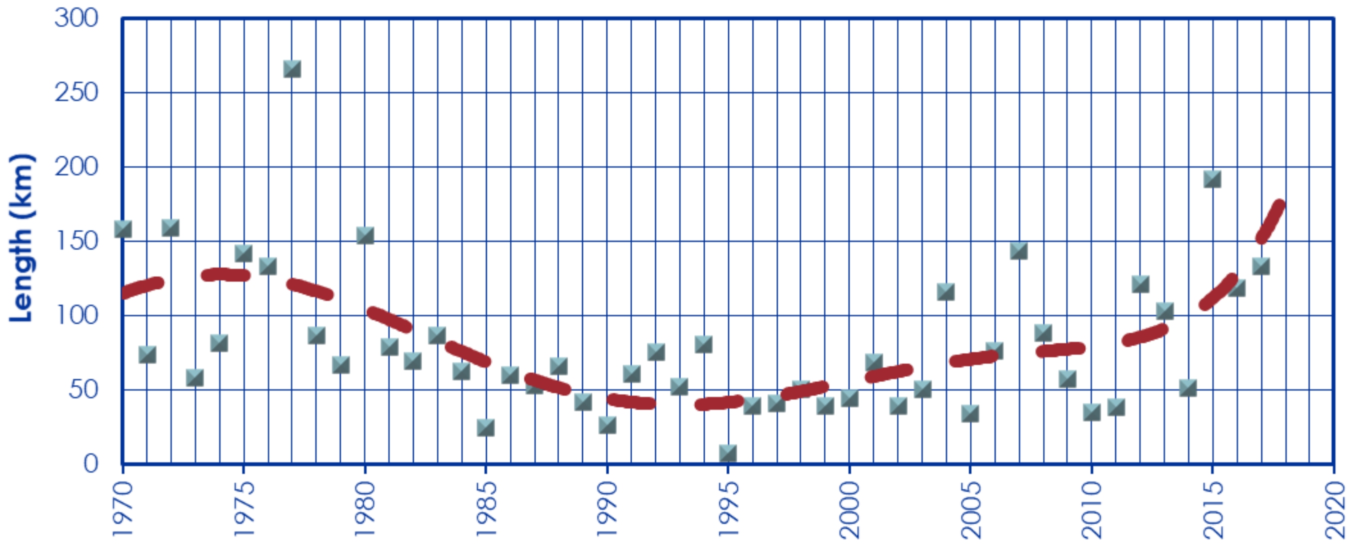


Figure 4-45: Rate of rehabilitation for paved roads 1970 to 2019

Applying cost-effective preventive maintenance actions, such as resealing, can prevent premature failure and extends the life of the road, but in the long-term, rehabilitation of the structural layers is necessary to maintain the roughness levels of service and minimise road user costs.

4.8.2 Structure ages

The ages of the Structures that are currently known in the branch is shown in Table 4-40.

Table 4-40: Summary of the age of the assets per asset types as at June 2020

Area	Asset Type	Average Age, yr.
Cape Winelands	Roads	34
	Bridges	50
	Large culverts	27
	Gantries	0
	All Signs	19
Central Karoo	Roads	34
	Bridges	52
	Large culverts	29
	Gantries	0
	All Signs	22
Garden Route	Roads	34
	Bridges	49
	Large culverts	20
	Gantries	0
	All Signs	21
Overberg	Roads	34
	Bridges	51
	Large culverts	28
	Gantries	0
	All Signs	19
West Coast	Roads	34
	Bridges	50
	Large culverts	28
	Gantries	0
	All Signs	20
City of Cape Town	Roads	35
	Bridges	47
	Large culverts	25
	Gantries	0
	All Signs	19

4.8.3 Plant equipment ages

In Figure 4-46 the age distribution of the plant equipment is shown. More than 80% of the equipment are less than 20 years old, the equipment older than 10 years should be inspected and a maintenance/replacement schedule should be created for this equipment.

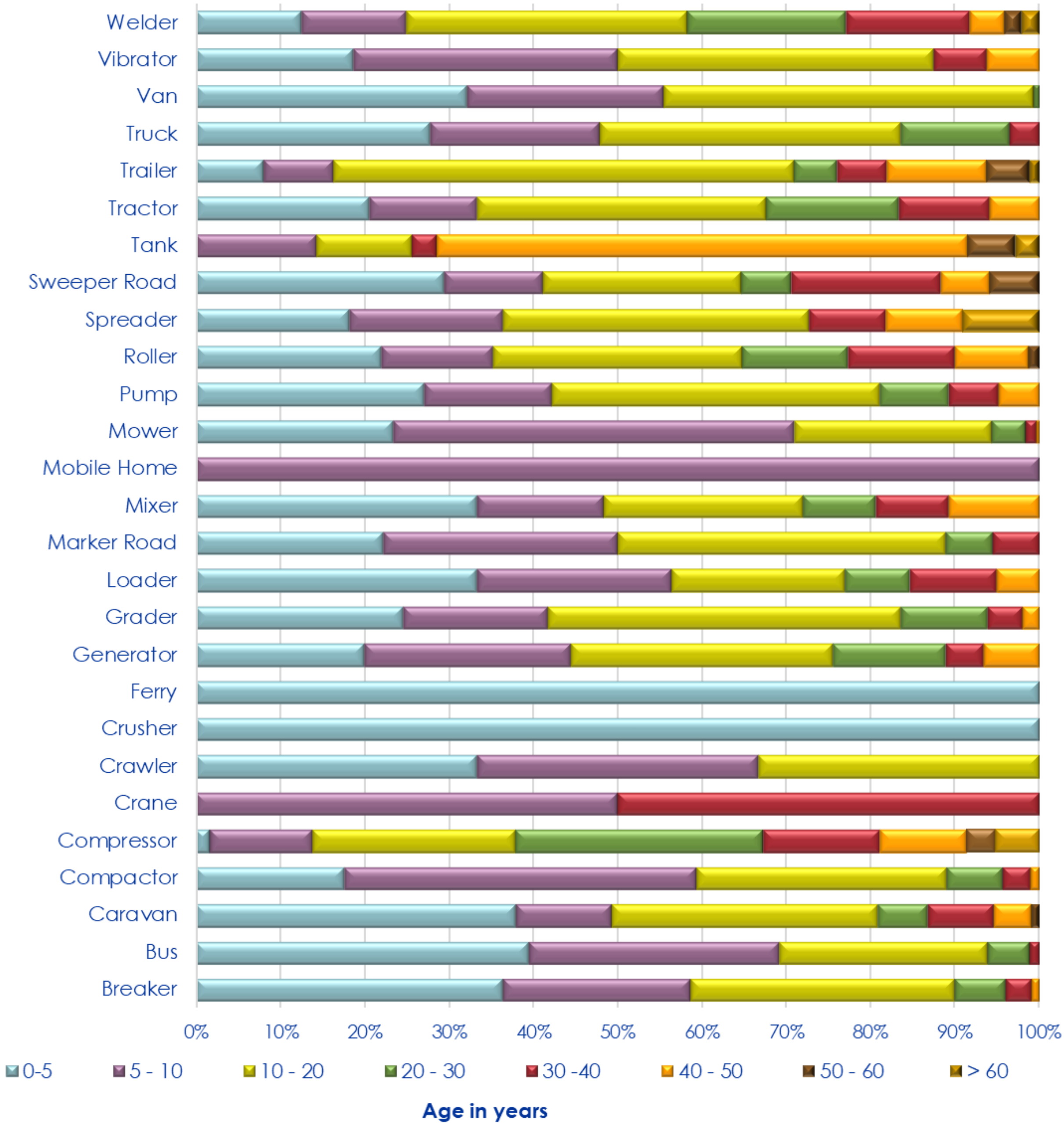


Figure 4-46: Age distribution of plant equipment

4.9 Trend analysis

4.9.1 Visual condition trends

The historic condition distribution of the carriageway-kilometres of the managed paved road network, per year, by road length and vehicle-km travelled, is shown in Figure 4-47and Figure 4-48 respectively. A total of 12.7% (approximately 898km) of the carriageways on paved roads are in a poor or very poor condition. In 2019 there has been an 3.2% increase in the length of road in poor and very poor condition, this is related to the UniCity roads being added in 2019.

The proportion of poor and very poor roads in terms of vehicle-km distribution has also increased and skewed the previous results because of the inclusion of UniCity roads, and some of the poor and very poor roads from the UniCity data has very high traffic volumes. The maintenance focus of these roads is clearly not aligned with the current maintenance focus of the Branch. The trend of visual condition distribution in terms of vehicle-km has remained fairly constant from 2008 to 2018.

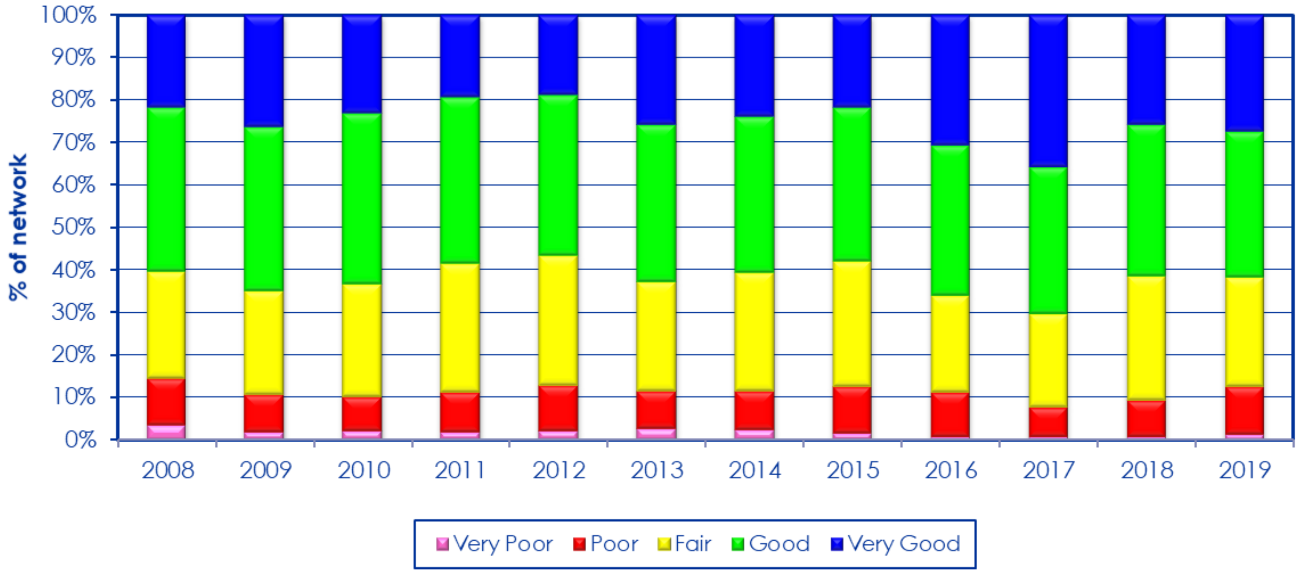


Figure 4-47: Change in the VCI by road length of the paved road network 2008 to 2019 (2019 including UniCity roads)

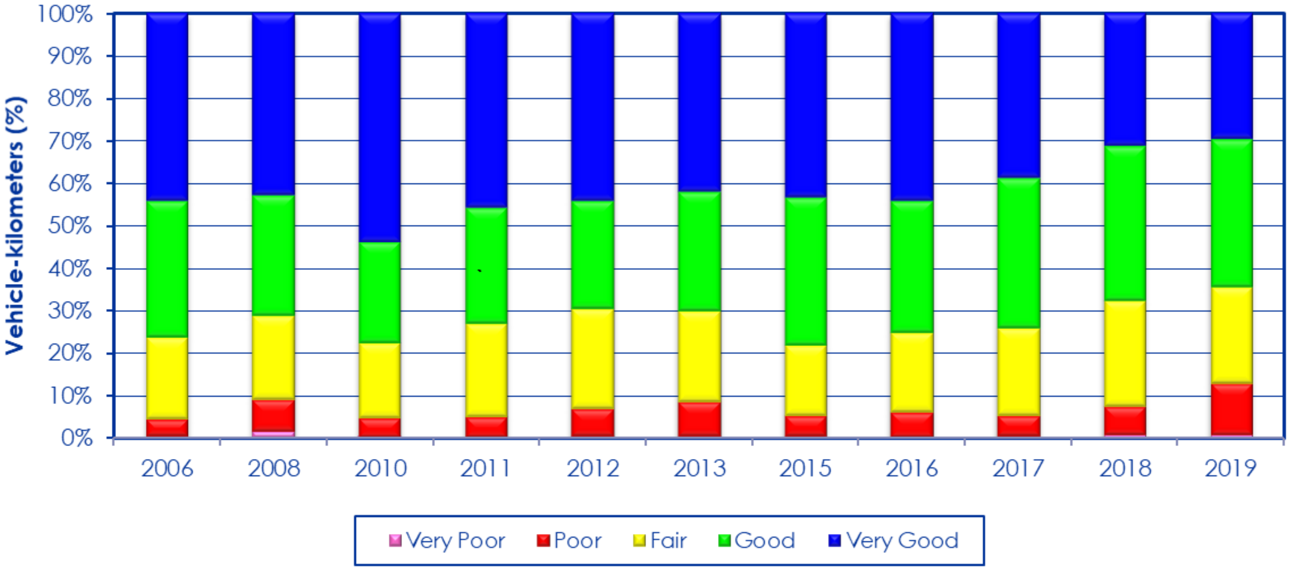


Figure 4-48: Distribution of the VCI of paved roads by annual vehicle-km travelled 2006 to 2019 (2019 including UniCity roads)

The trend of poor and very poor visual condition is shown in Figure 4-49. The roads in poor condition and weighted by length show a cyclic trend between about 8 and 12 %. There is also a cyclical trend between 4 and 8% for roads in poor condition that are weighted by vehicle-km. Comparing these trends reveals that the condition of roads weighted by vehicle-km is up to 4% percent lower than the condition weighted by length. However, in 2017 both these trends decreased and the difference between these two trends reduced by 2%, which is attributed to the amount of reseals conducted by the Branch in recent years. Therefore, the traffic experiences fewer roads in poor condition compared with the distribution of poor roads in the network, implying that the roads carrying more traffic are in better condition. The inclusion of the UniCity roads has increased both the values quite drastically for 2019, this clearly shows that the maintenance strategies on these roads are not aligned with the Branches maintenance strategy.

Those roads that are in very poor condition, both weighted by length and by vehicle-km, show a flat to declining trend up until 2016, thereafter increasing slowly in 2017 and 2018. Comparing the very poor trends reveals that the condition of roads weighted by vehicle-km is between 1 and 2% percent lower than the condition weighted by length. Therefore, over the last decade, the traffic experienced fewer roads in very poor condition compared with the distribution of very poor roads in the network. Over the last 3 years there has been a small difference between the condition weighted by length and by vehicle-km, indicating that traffic experiences almost the same length of road in very poor condition as occurs on the network. There has not been such a drastic change to the very poor roads added from the UniCity roads.

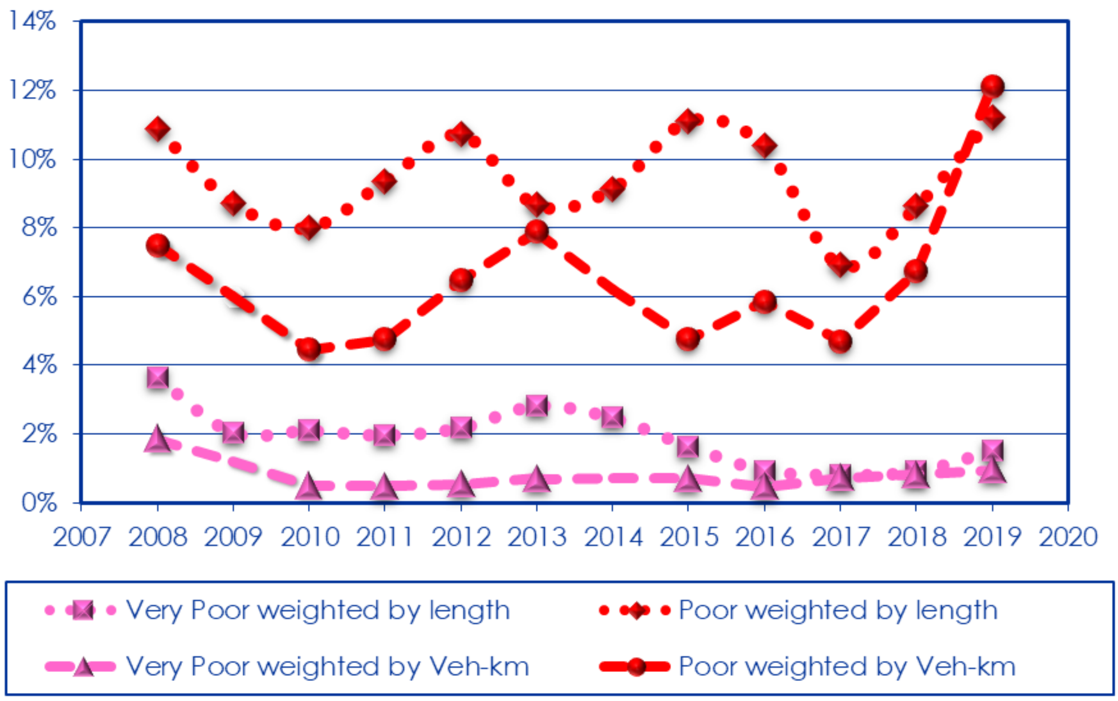


Figure 4-49: The percentage length of paved roads in a poor and very poor visual condition weighted by length and by vehicle-kilometres 2008 to 2019

The VCI of each road section is weighted for length and vehicle-km to calculate the network condition number (NCN), representing the condition of the paved road network in a single number (Committee of State Road Authorities, 1994). The NCN is used to compare overall visual condition of two or more networks and to monitor the change in condition of a network over time.

Figure 4-50 shows the historic trend in the overall condition of paved roads, as measured by the Network Condition Number (NCN) weighted by length and by vehicle-km. The trend in NCN weighted by length has been relatively flat for the period 2009 to 2015, when the NCN increased from 64 in 2015 to 76 in 2017. This can be ascribed to the increase in reseal between 2015 and 2017. In 2018 and 2019 there has been a rapid decrease in the average condition value, however the NCN is still above the desired benchmark value of 70 based when weighted by length. Refer to Appendix H – Benchmarking, for the basis of determining the benchmark.

The trend in NCN weighted by vehicle-km has been above the benchmark of 70 and relatively flat to declining over the period 2007 to 2015. The NCN kicked up to 78,4 in 2016, and gradually decreased in 2017 (77,0), 2018 (74,0) and 2019(with the added UniCity roads it is 72,9). The NCN weighted by vehicle-km has been between 10 and 15% better than the NCN weighted by length over the period 2007 to 2015, however this difference decreased to 2% in 2017. This reduction is a measure of how effectively the Branch maintains the network for the benefit of the users, i.e. the objective to provide a greater benefit experienced by the users.

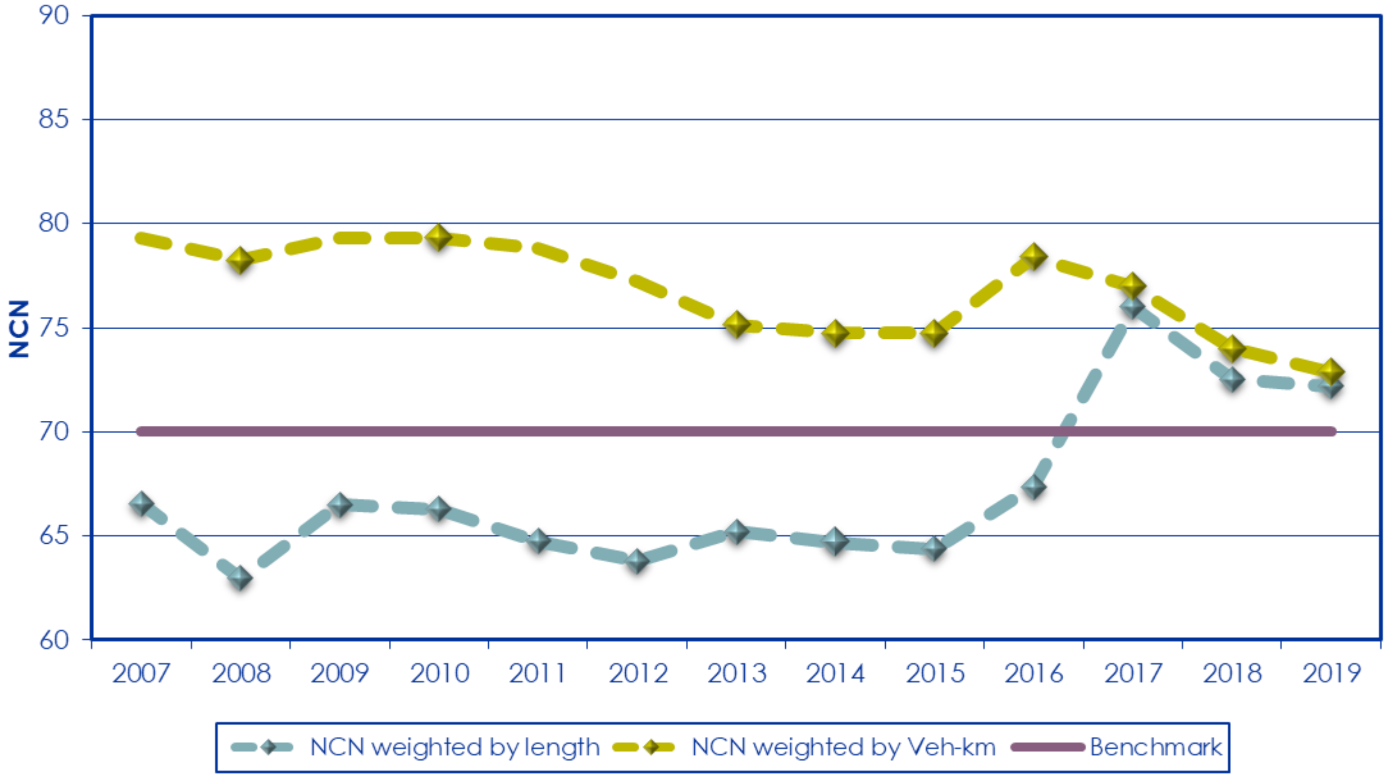


Figure 4-50: The historic trend in the overall network condition of the paved road network 2007 to 2019

The historic condition of the maintained unpaved road network by road length and vehicle-km over the last decade is shown in Figure 4-51 and Figure 4-52 respectively. The trend of visual condition by road length, followed an upward trend in the last couple of years with a significant increase in very poor roads in 2016. However, since 2017 the condition has decreased and remained fairly constant in 2018 and 2019.

The trend of visual condition in terms of vehicle-km has been decreasing from 2012 to 2015 but reversed in 2016 with a large increase in very poor and poor roads. In 2019 the percentage of road in poor and very poor condition weighted both by length and vehicle-km has shown a slight increase.

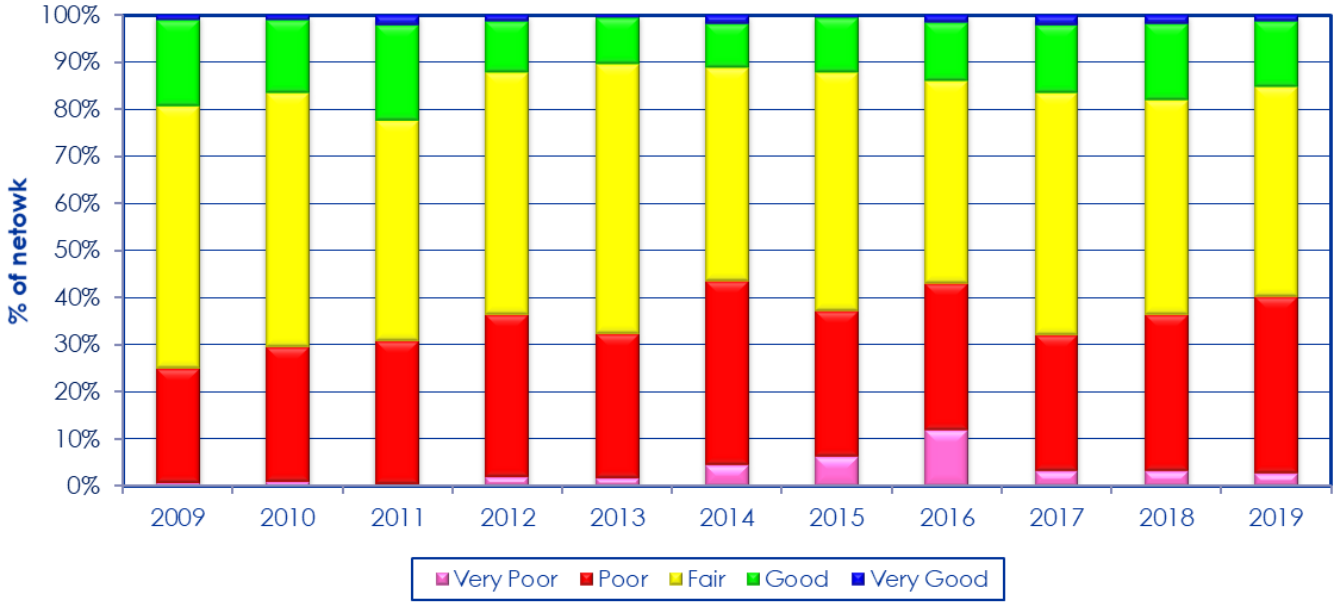


Figure 4-51: Change in the visual condition by road length of maintained unpaved road network 2009 to 2019

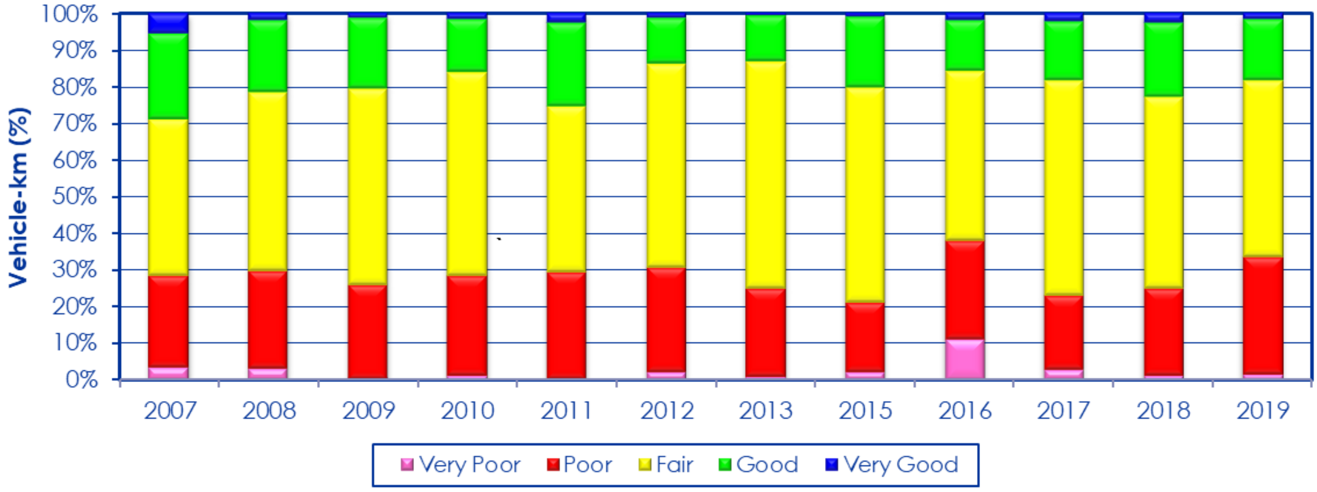


Figure 4-52: Distribution of the VCI of maintained unpaved roads by annual vehicle-km travelled 2007 to 2019

Figure 4-53 shows the historic trend in the overall condition of unpaved roads, as measured by the NCN weighted by length and by vehicle-km. Network performance is compared to the desired benchmark NCN of 60. Refer to Appendix H – Benchmarking, for the basis of determining the benchmark.

The NCN weighted by length has been in the range of 46 to 56 per cent over the past ten years. There has been a steady incline in the last three years from 46,0 in 2016 to 55,93 in 2018, however in 2019 the NCN of the unpaved roads has declined again to 52. The NCN remains below the desired value of 60. The NCN weighted by vehicle-km has had a flat trend with an NCN of approximately 48 from 2008 to 2013, after which it rose rapidly to a NCN of 55 and then declined to 52,9 in 2016. Since 2017 the value has steadily improved to just below the desired NCN of 60 in 2018 (59). However, 2019 has seen a decline in this value to 57.

The difference between NCN weighted by length and by vehicle-km is negative up to 2013 with an average difference of -4,7, after which the NCN becomes positive with an average difference of 7,4. This is very significant change and indicates that up to 2013 the majority of road users experienced worse roads than the average network condition, but after 2013 the majority of road users experienced better roads than the average network condition. This indicates that since 2013 that the roads with the most traffic are in better condition than the lower trafficked roads.

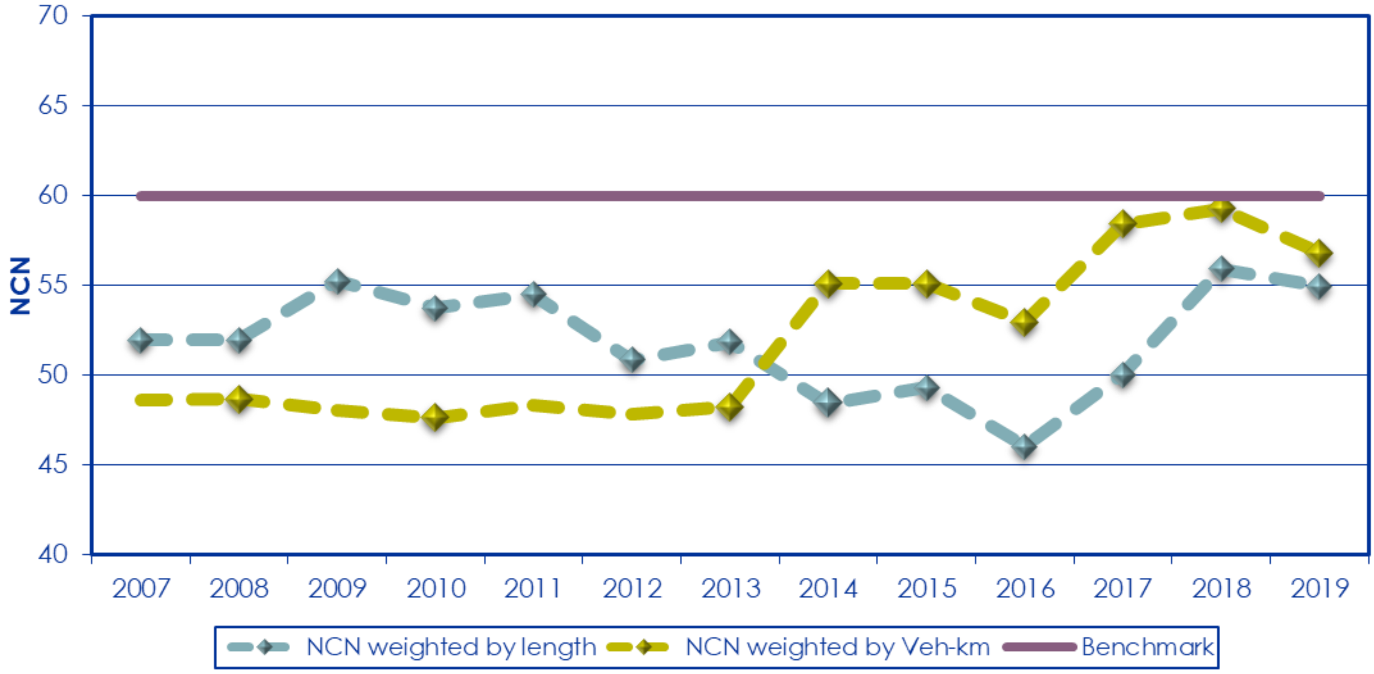


Figure 4-53: The historic trend in the overall network condition of maintained unpaved roads 2007 to 2019

4.9.2 Gravel thickness trend

The change over time in the average gravel thickness on the maintained unpaved road network is shown in Figure 4-54. Over the last ten years, due to underfunding, the difficulty in obtaining environmental approvals to excavate suitable regravelling material, as well as insufficient capacity for regravelling, there has been a steady decline in average gravel thickness on the provincial unpaved roads, from about 29 mm in 2009 to about 27 mm in 2016, and 19 mm in 2019. There is practically no gravel left on the majority of roads. The average gravel thickness should ideally be above 75 mm, while the minimum average thickness should not drop below 60 mm to facilitate blading maintenance.

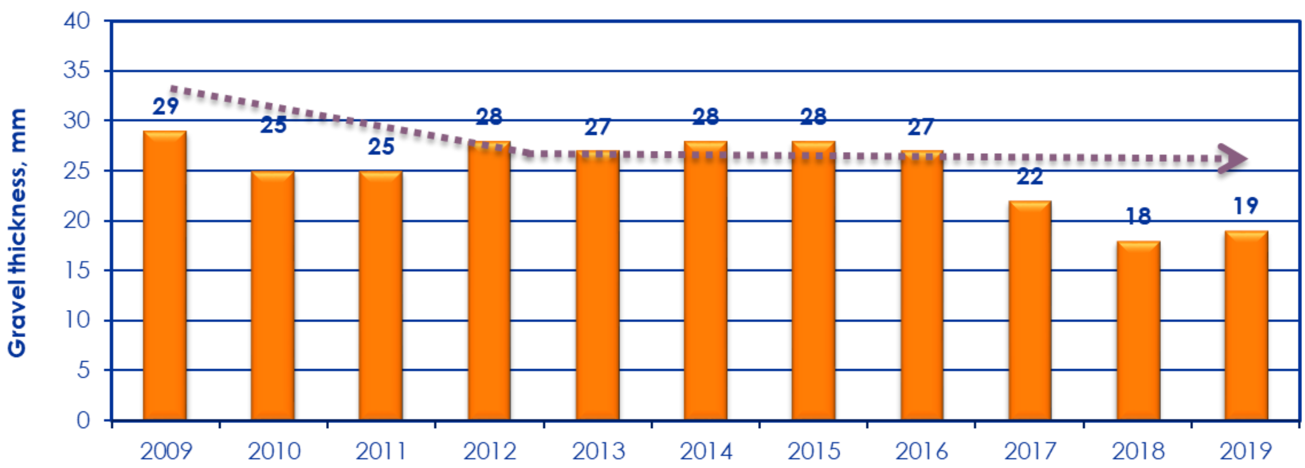


Figure 4-54: The historic trend in gravel thickness on the maintained unpaved road network from 2009 to 2019

Figure 4-55 shows how the gravel thickness distribution has changed over a decade. It is evident from the trend that majority of the unpaved road network are within the 0 to 25mm thickness range. In the last 4 years there has been a significant increase from 2016 to 2018, with a slight decrease in 2019.

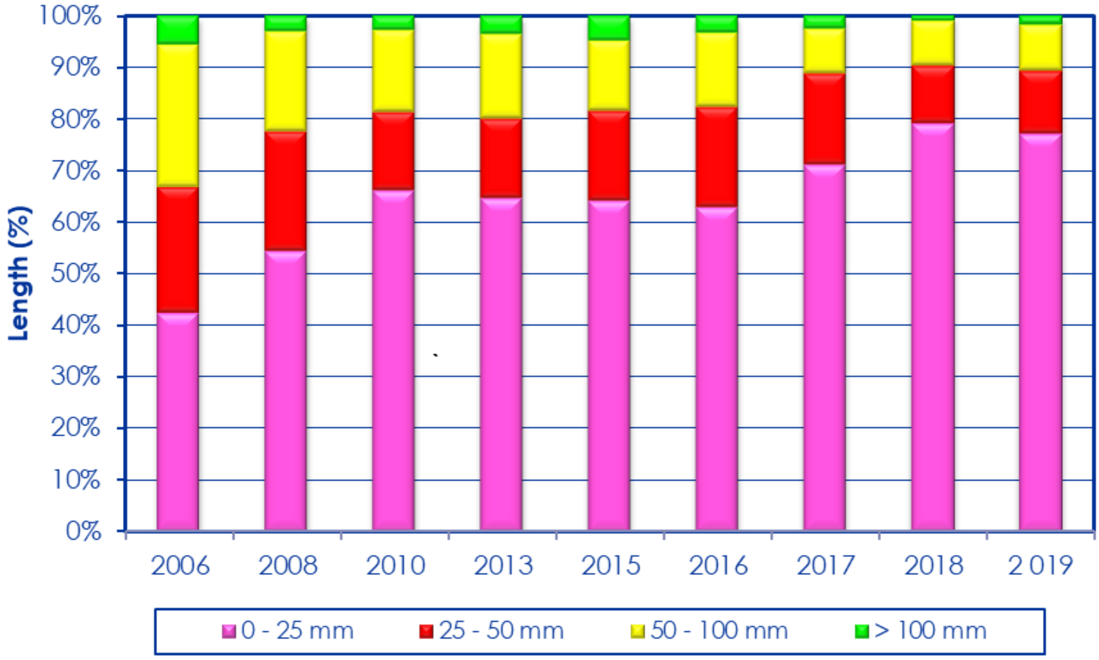


Figure 4-55: Gravel thickness distribution on unpaved roads 2006 to 2019

4.9.3 Resealing demand trend

The trend of resealing demand over the last decade is illustrated in Figure 4-56. The legend refers to the categories below:

- A = reseal now if funds are available;
- B = reseal next year;
- C = reseal in the future; and
- None = No reseal priority.

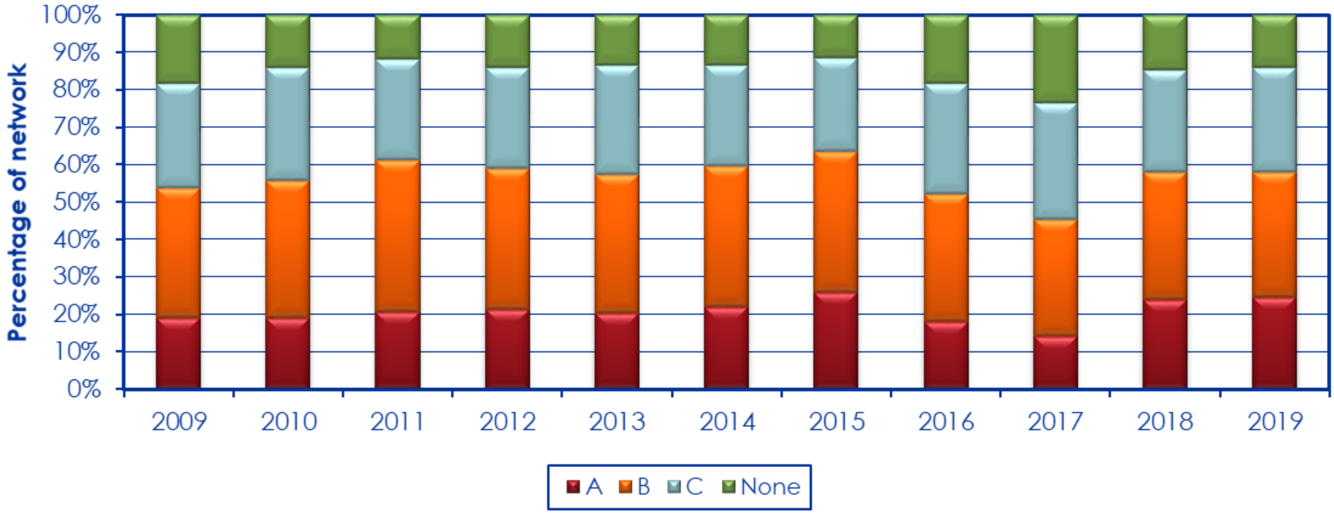


Figure 4-56: Resealing demand of paved roads according to urgency 2009 to 2019 (includes UniCity roads)

The trend of reseal condition Number (RCN) is shown in Figure 4-57. The RCN is calculated using the same formula as for NCN [TRH 22 (Committee of State Road Authorities, 1994)], but substituting VCI for Reseal Condition Index (RCI) and using the weighting condition (W_i) values listed in Table 4-41.

Table 4-41: Condition weights for RCN calculation

Condition category classification of segment *i*	Condition weight (W*i*)
A	3,33
B	2,33
C	1,5
None	1,0

Currently no benchmark has been set for RCN. However, the following is a rough guideline:

- No more than 2% in the A category;
- No more than 8% in the B category; and
- No more than 20% in the C category.

The RCN trendline as shown in Figure 4-57 follows a gradual upward trend over the last decade. The RCN has decreased slightly from 2018 (40,3) to 2019 (40,2). This slight decrease is also reflected in the increase need to reseal now (A category) as shown in Figure 4-56.

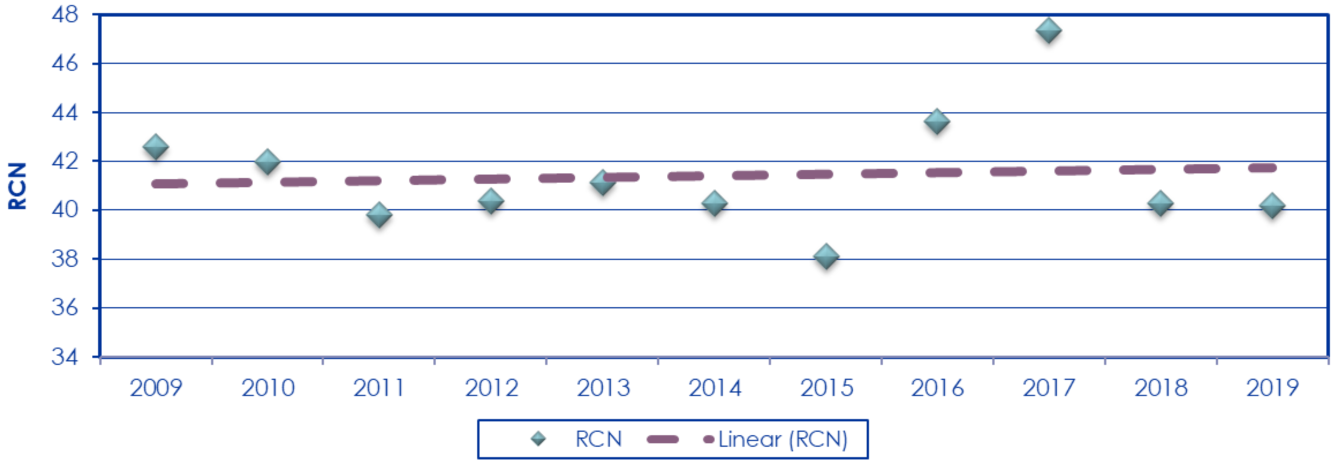


Figure 4-57: Historic trend of reseal condition number 2009 to 2019 (includes UniCity roads)

The decrease in the RCN and the increase in the demand for reseal since 2018 shows that more attention should be given to reseals in the next financial year. Roads that are not resealed in time result in a moisture accelerated distress state that leads to a growing rehabilitation demand. A tipping point is reached where the rehabilitation demand outstrips available resources. If the increase in RCN in 2016 and 2017 can be maintained in the future, it will result in a less vulnerable paved road network.

4.10 Performance gap analysis

4.10.1 Comparison of actual conditions with service levels

The comparison of actual conditions with service levels has been covered under paragraph 4.3.5 for roughness, rutting, surface texture and deflection measurements.

Table 4-42 reflects actual visual conditions compared with level of service per road category. The average visual conditions are above the required level of service.

Table 4-42: Comparison of actual visual condition and levels of service for June 2020 (includes UniCity roads)

Road class	TRH 26 class	Level of Service VCI	Average actual condition VCI
DR/OP	4, 5	45,0	62,6
MR	3	52,5	67,1
TR	1, 2	55,0	70,2

4.11 Climate change impact

The impact of climate change on the management of road network in the Western Cape has not yet been determined in any detail. Climate predictions indicate a hotter, drier climate with less rain and the likelihood of more extreme weather leading to floods and droughts (Department of Environmental Affairs, 2013). The impact of extreme weather events that often caused floods has in the past seen significant destruction to road infrastructure, with the unpaved road network and drainage structures being most affected. The influence of prolonged drought has caused water shortages and this has been a constraint on road works, particularly periodic maintenance of unpaved roads.

The predictions on climate change indicate that there is a need to enhance the resilience of critical infrastructure to cope with the effects of climate change and this will put additional demands on funding resources. In this respect, resilience is defined as follows (Climate Adaption Platform, 2017):

"The ability of systems (including infrastructure, government, business and communities) to proactively resist, absorb, recover from, or adapt to, disruption within a timeframe which is tolerable from a social, economic, cultural and environmental perspective".

4.12 COVID-19 impact on the road network

The Covid-19 pandemic has caused a multi-faceted impact on the road transportation system as a whole. The initial measures implemented by the government to contain the spread was through quarantines, travel restrictions and lockdown of cities. This has resulted in a reduction in aggregate demand, with particular impacts on service sectors such as tourism, retail, hospitality, and civil aviation. Figure 4-58 shows the channels of how Covid19 has impacted on international economies (ESCAP, 2020).

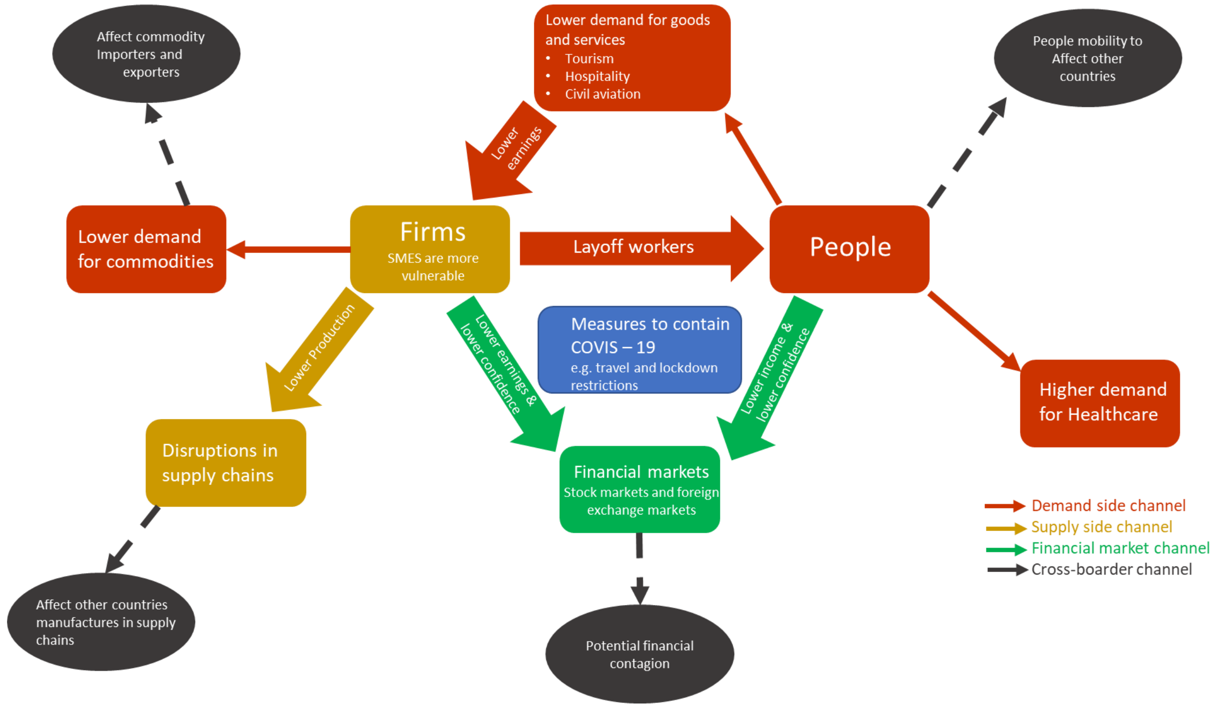


Figure 4-58: Channels of COVID-19's impact on economies

Some of the significant impacts on road transportation due to lockdown include:

- Changes to travel demand and patterns;
- Loss of toll and other income;
- Revision of road authorities' budget;
- Changes in freight movement; and
- Delivery of road work programs:
    - Delay in procurement to tender out road works;
    - Loss in reseal production on road construction sites; and
    - Liquidation of contractors and subcontractors.

The impact of Covid-19 on the management of road network in the Western Cape has not yet been determined in any detail. Pandemics impact the organisations asset management capabilities – its people. Recovery is restoring management control and organisational capability (Roberts, 2020).

In response to COVID-19, the branch needs to investigate the impact of the pandemic, on the performance of road network in the Western Cape. Furthermore, development in the resilience of the branch's asset management systems and infrastructure Continuity of Operations Plans (COOP's) will be required to establish and train robust management frameworks to control risks through a program of managed response, recovery and restoration. Stopping the spread is not just about social distancing, but also enabling teams to work harmoniously, with limited physical interaction and new ways of management to ensure the delivery of essential services.

4.13 Composite indices

A deduct point method has been used to produce an overall functional status of the road network. The outcome of this method has been presented in the visual condition index graphs for both the paved and unpaved road network of the preceding sub-sections.

It is envisaged that the road network indices will be combined to summarise the condition and functional data of various assets managed by the Branch in the long term.

4.14 Road Safety Assessments

The road environment and road design has an important impact on road safety. All roads have the risk that a crash will occur, but this needs to be minimized as far as possible from an engineering perspective. A Road Safety Audit can be utilised effectively as a crash prevention measure during the preliminary and design stages of any road or transportation project. It allows the identification of potential crash-causing road elements which can be removed before implementation. It also acts as a crash reduction tool on existing facilities by reporting on the safety performance and crash potential of the facility, again identifying safety deficiencies in the face of incomplete crash information.

South Africa recognized the need for implementing this road safety tool by compiling the updated South African Road Safety Audit Manual (SARSAM). The manual aims to assist road authorities to conduct road safety audits for new road projects and road safety appraisals for existing roads in order to identify potentially hazardous locations and put remedial measures in place to minimize crashes on the road network. However, this document **has not yet been formally approved by the Committee of Transport Officials** (Department of Transport, 2017).

The SARSAM uses three terms to describe road safety investigations, namely road safety engineering assessment, road safety audit and road safety appraisals. It defined these three types of investigation as follows:

> ***Road safety engineering assessment**: This is a screening process to establish the road safety status of sections of an existing road network. It is a network based process performed on selected sections of the road network using a set of pre-defined key indicators to determine the feasibility of safety improvement of such a section. The road safety engineering assessment process provides a list of prioritised locations that should be further investigated.*
>
> ***Road Safety Audit**: This is a formal examination process of a new or upgrading project where interaction with road users takes place, in which an independent and qualified team identifies potential road safety problems and suggest measures to mitigate those problems. The road safety audit process results in a report describing potential safety concerns that should be reconsidered prior to advancing to the next stage of the design process or to physical construction or taking over completed construction works.*
>
> ***Road Safety Appraisal**: This is a systematic examination process of an existing road location, in which an independent and qualified team reviews onsite conditions and available historical evidence to identify existing or potential road safety problems and suggest measures to mitigate those problems. The road safety appraisal process results in a report describing potential safety concerns on-site and suggested remedial measures.*

As mentioned in Section 3.1.4 of the RAMP, the only road safety investigation that needs to be reported on is Road Safety Appraisal and this safety investigation will be further discussed in this document.

Identification and packaging of Road Safety Appraisals

The strategies implemented in road traffic safety management can be reactive or proactive in nature:

- A reactive approach to road safety is associated with the identification of locations experiencing safety problems (screening), problem definition (diagnosis), and the identification and implementation of countermeasures (cure); and
- A proactive approach to road safety is associated with the prevention of safety problems before they manifest themselves in the form of a pattern of crash occurrences.

In both these approaches, it is necessary to identify safety deficiencies that need to be actioned to diagnose the safety problems, and then identify and implement countermeasures to remedy the deficiencies. The lack of credible crash information on the South African road network casts a shadow upon the use of this information and also any crash-based analyses. Performing rudimentary quality control on the available information often indicates that the quality and the reliability of the information would be questionable and not appropriate to be used as a basis for statistical analysis or recommendations for remedial measures. Studies has also shown that a major constraint for road safety appraisals on existing roads in the past has been the fact that the recommendations were not implemented, because it was not co-ordinated with major reseals and rehabilitation projects (Roads Traffic Management Corporation, 2012).

To overcome this, the Branch has adopted the approach of co-ordinating the road safety appraisals with reseal and rehabilitation projects. This methodology does ensure that road safety appraisals are not being done for the sake of road safety auditing, but that the opportunity is taken to make a difference in the safety performance of such a road. The fact that the appraisal process should be coordinated with the resurfacing / pavement rehabilitation process ensures the presence of the design team and the possibility to commission the appraisal as additional or specialist services through the Agreement for Consulting Engineering Services.

Professional Team Conducting the Road Safety Appraisals

Since there is no approved Technical Highway Method for conducting Road Safety Appraisal, the Branch has delegated the roles and responsibilities of the independent audit team as defined in the SARSAM to the design consultant, who is registered in terms of the Engineering Profession Act. The design consultant is therefore the competent person or team responsible for the following Road Safety Appraisal objectives on projects:

- To ensure compatibility between the safety features of a road and the functional classification of the road;
- To identify any feature that can, with time, create a safety problem; and
- To identify all features in the road environment that pose a safety hazard to any of the road users.

The following activities are followed as part of the Project Identification and Report stages objectives of a project:

- Analysing exiting data – for instance the prevalence of specific of crashes as compared with control data, if possible;
- Assessment of risks whereby the design consultants would make a judgement of the importance of remedial measures for specific concerns;
- Site inspections; and
- Identification of road safety concerns should be done for all issues, irrespective of the fact that the origin may be routine maintenance related;

Typical strategic improvements applied on Projects

The following improvements mechanisms are currently implemented on Reseals and Rehabilitation Projects within a constraint budget:

- Barrier lines - Barrier lines are corrected to prevent overtaking on road sections with inadequate sight distance, normally over crests and around horizontal curves. A general programme is implemented to ensure that barrier lines are long enough, well maintained and combined with additional signage and road markings where necessary;
- Road Marking and Signs are replaced and corrected according to the speed limit review;
- Investigations for passing opportunities to improve road safety;
- Access management, ensuring minimum spacing standards between intersections and reducing the number of intersections and accesses on a road;

- Schools - Safe areas around all schools must be developed where there is high conflict between vehicles and children walking and cycling to the school;
- Policy for Setting of Speed Limits - The Department of Transport has a draft policy for the setting of speed limits. Speed limits are often reduced as a symptomatic measure if crashes occur, but do not always address the real cause; and

  a policy needs to be revised by National Department of Transport, incorporating the recent changes to speed limits. Speed limits on roads should be tested against the operational speeds, and changes to speed limits should involve a multi-disciplinary team of traffic law enforcement personnel, engineers and other relevant disciplines, applying the policy on the setting of speed limits.

Reporting on Road Safety Appraisal Reports on Paved Network

The Branch is not in a position to provide the actual kilometres and the number of reports that were implemented as part of a Road Safety Appraisal, as no data has been collected for this process. The Branch has however, updated the project inception report for the reseal projects in 2017, to enable the design consultants to document and identify potentially hazardous locations and put remedial measures in place to minimise crashes on the road network.

It is envisaged that a strategic safety engineering database is setup to record the number of Road Safety Appraisal reports compiled from the above project process. The existing project monitoring systems will also be utilised to determine the kilometres of remedial measures implemented in future.

Chapter 5 – Needs Determination

5.1 Current assets

The data used in this chapter is the 2018 visual assessment data and the lengths of roads is shown in Table 2-1.

5.1.1 Historical context

Historically, construction of the majority of the paved road network took place in the 1950s and 1960s. This was followed by reconstruction of parts of the trunk road network to modern standards and to upgrade their load carrying capacity in the 1970s and early 1980s. A maintenance orientated strategy of regular sealing and routine maintenance of roads was developed over this period. From the mid-1980s to the present, there was a reduction in the rehabilitation and replacement of roads with steadily rising heavy vehicle and E80 volumes, especially since the mid-1990s. This resulted in a build-up of a backlog in rehabilitation and resealing need, as well as a requirement to upgrade trunk roads with old geometric standards to current standards and to upgrade unpaved roads carrying high traffic volumes to paved standards.

5.1.2 Factors influencing demand

The increase in population as well as the expected growth in the economy of the Western Cape will translate directly into a greater demand for transport, and road transport in particular.

The main factors influencing the demand for additional funding to maintain current assets are the backlog in the following:

- Routine maintenance of all roads;
- Regravelling of unpaved roads;
- Upgrading of unpaved roads to paved roads;
- Resealing of paved roads;
- Light Rehabilitation of paved roads; and
- Rehabilitation and reconstruction of paved roads.

Anticipated changes in community expectations with regards to transport may also affect demand. However, it is difficult to estimate future changes in community needs, apart from stating that the road infrastructure of the Western Cape will not, given current budget levels, be able to support a sustained high growth rate. As the economy grows, the demand for road infrastructure will become a serious service delivery issue unless stringent transport demand management imperatives such as car-pooling, rail-readiness in terms of freight-transfer, transit-oriented-development and intelligent transport systems, etc., are put in place over the medium to long term to transform the land transport burden from being predominantly private-vehicle-based to a multi-modal shared-based system.

5.1.3 The demand for resealing

The demand for resealing is determined using the condition ratings of the visual assessments. Resealing is the process of constructing a new, waterproof surface on an existing road in order to prevent damage causing premature, moisture-induced failure and ongoing deterioration of a road, but cannot prevent the normal, direct traffic-related deterioration of the pavement layers. It should be noted that riding quality (roughness) is not affected by reseals.

Resealing is the most important preventive maintenance action for preservation of the WCG network

Figure 5-1 shows the distribution of historic resealing versus the future predicted need for resealing and the proposed resealing length of the Branch. The predicted need was calculated according to the expected seal life of the current seals on the network.

The analysis estimated 2 047 km of paved roads are at the end of their expected surface life and require resealing in 2020/2021. A further expected need of approximately 1 385 km was estimated for resealing during the period from 2021 to 2026.

The actual rate of resealing has increased slightly from 362 km for the period of 2010 to 2013 to 408 km in the period from 2014 to 2018. Based on the committed projects for 2019 a further 429km of roads will be resealed during this year. This additional expenditure had a positive impact on the overall visual condition of the paved road network (Figure 4-47). According to the MTEF Programme of the Branch for the period 2020/21 to 2024/25, approximately 374 km of road is scheduled to be resealed annually. The planned resealing levels for the next three years are therefore on par with the previous three years and improvement in road condition is therefore possible, especially in the light of the high predicted resealing need shown in Figure 5-1. The comparison of the predicted resealing need versus the proposed resealing suggests that it might be possible to ensure the network performance does not decline over the next few years.

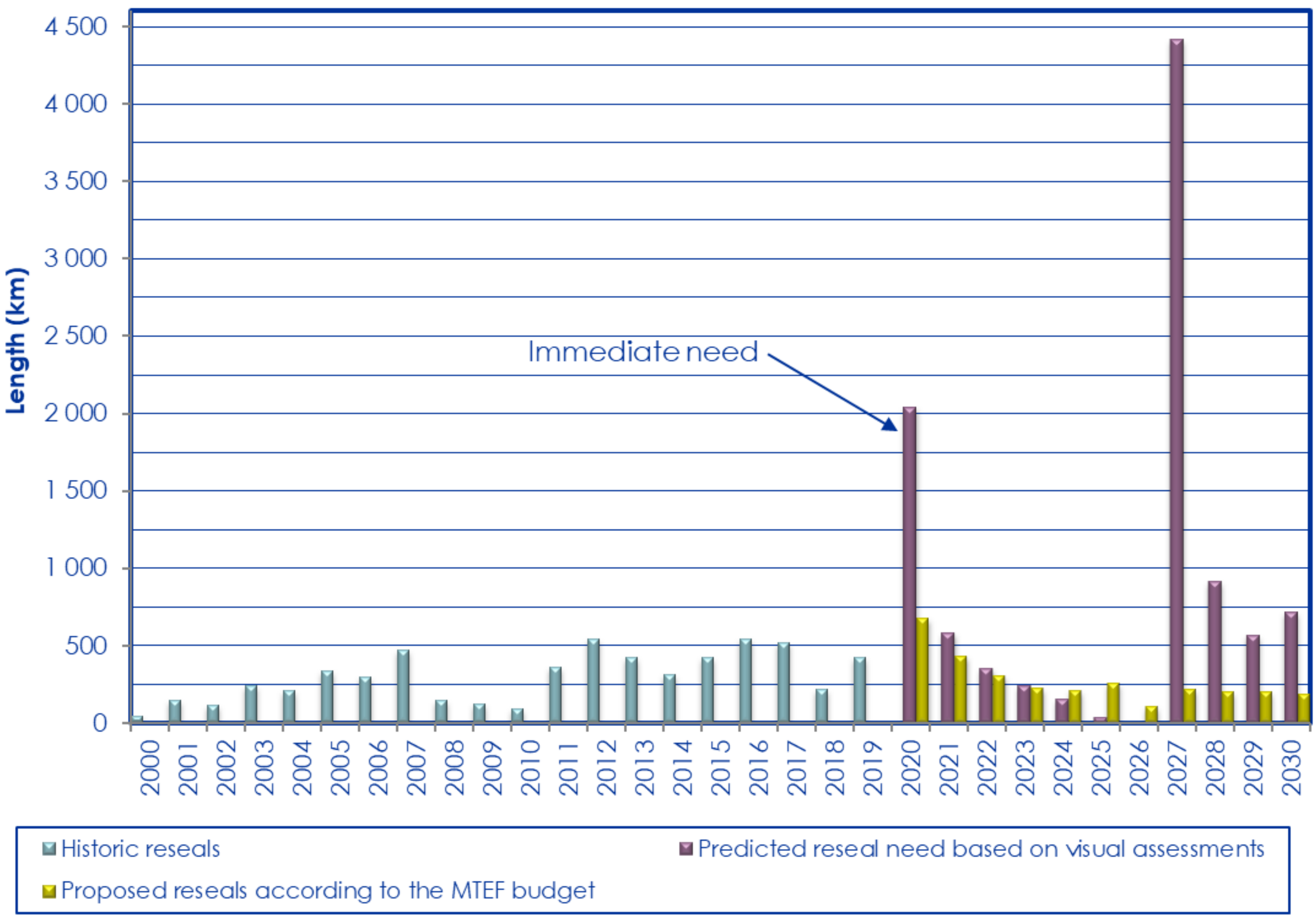


Figure 5-1: Historic resealing of paved roads versus the predicted need and proposed MTEF budget resealing programme from 2000 to 2030

The resealing need categorised according to urgency is shown in Figure 5-2. About 58% of the seals on paved roads will need to be replaced within the next two years.

Limitation: The need for resealing includes roads that need to be rehabilitated.

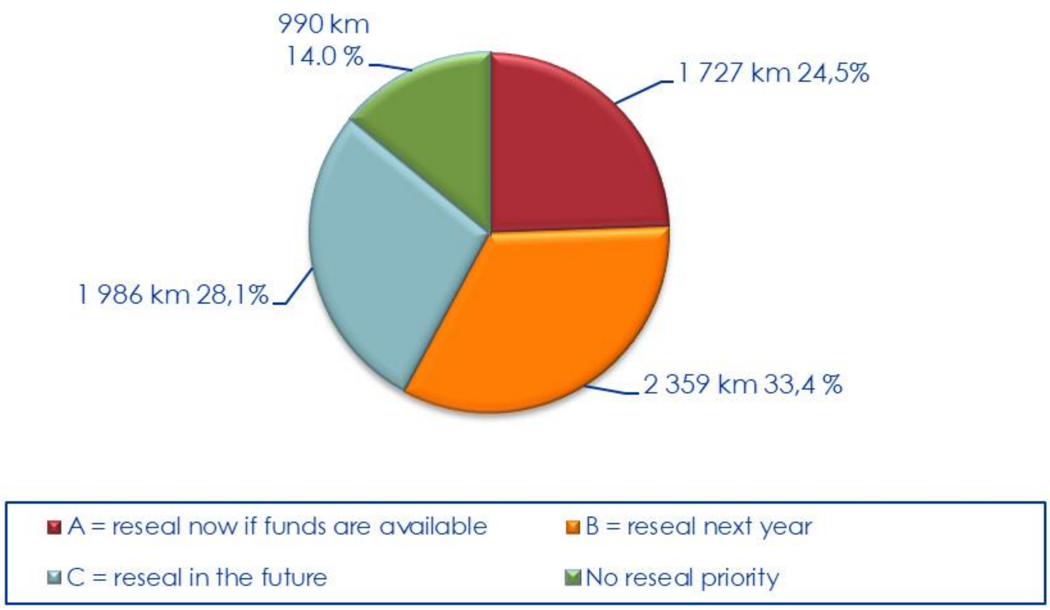


Figure 5-2: Resealing need on paved roads according to urgency as at December 2019

5.1.4 The need for drainage maintenance

In addition to keeping the paved roads waterproofed with regular resealing, the importance of adequate drainage is emphasised. Roads are designed and constructed based on the assumption of adequate drainage by means of side drains and pipe culverts so that the level of service can be maintained as long as possible. The need for increased maintenance of side drains has been quantified from the annual visual surveys. Table 5-1 provides the statistics and it is clear that there is a substantial backlog of maintenance of side drainage of paved roads.

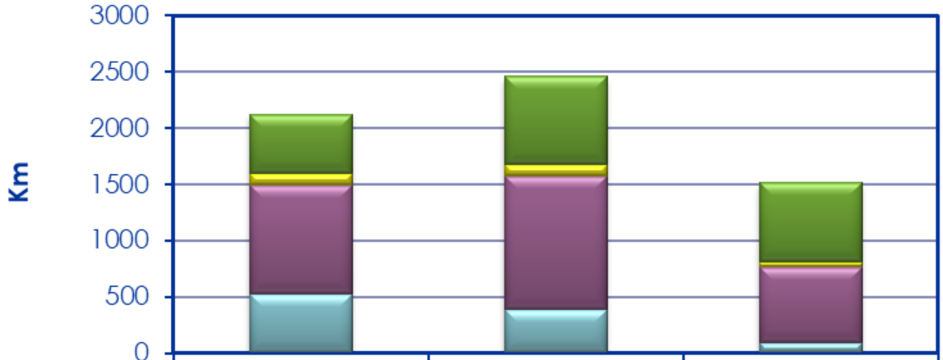
Table 5-1: Side drainage maintenance needs 2019

RCAM class	Paved roads		Unpaved roads	
	Carriageway-km	% of RCAM class of the network	Km	% of network
1	18,38	7,7	No data currently available	No data currently available
2	1048,13	37,8		
3	877,25	31,1		
4	683,73	57,8		
5	18,99	43,1		

5.1.5 Maintenance demand

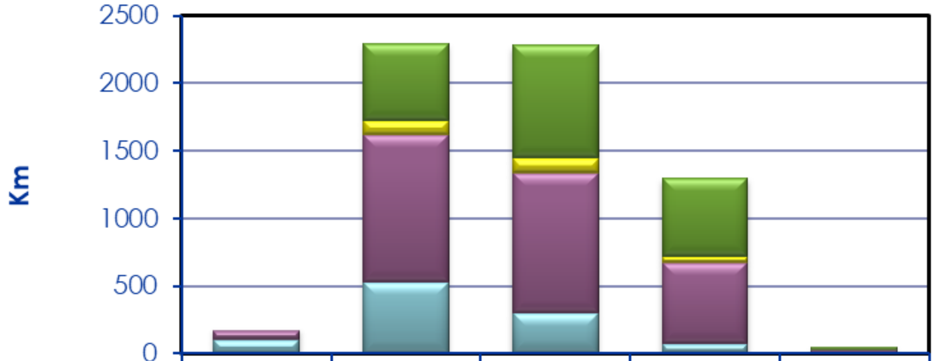
The maintenance demand in terms of crack sealing, patching, filling of ruts and shoulder defects is shown in Figure 5-3 and Figure 5-4 according to road type and RCAM classifications respectively. The length provided is the kilometres of road where the severity of the defect is ≥3.

- There is a significant backlog of maintenance with respect to shoulders, patching and crack sealing.



	Trunk	Main	Div/Minor
Shoulder defects	523,33	778,42	705,90
Rut filling	108,95	107,37	42,79
Patching	963,79	1185,78	668,41
Crack Sealing	525,19	387,35	97,31

Figure 5-3: Maintenance demand in km of road according to road category 2019



	1	2	3	4	5
Shoulder defects	0,00	571,08	834,12	579,66	22,79
Rut filling	0,00	108,95	106,63	43,53	0,00
Patching	65,28	1086,73	1041,69	603,63	20,65
Crack Sealing	106,73	529,08	297,99	71,19	4,86

Figure 5-4: Maintenance demand in km of road according to RCAM class 2019

The demand for line marking has been determined in terms of the number of kilometres of those markings that are in fair condition to worse, including where there are no markings. The total demand is approximately 2 641 km. This represents 38,4% of the paved road network. Figure 5-5 provides the distribution and data for each RCAM class. Class 3 has the highest demand for line marking.

- Assuming the limit of demand is set at 20% of the network per annum, i.e. paint on average once every 5 years, the average length of road for remarking would be at least 1 374 km per annum (excluding the extra requirements for multi-lane freeways and dual carriageways). The current total demand for line marking is approximately 2 641 km, which is significantly more than the expected demand. This indicates that there is a backlog of maintenance for line marking.
- Road paint marking framework contracts have been established to assist with the backlog of maintenance for line marking.

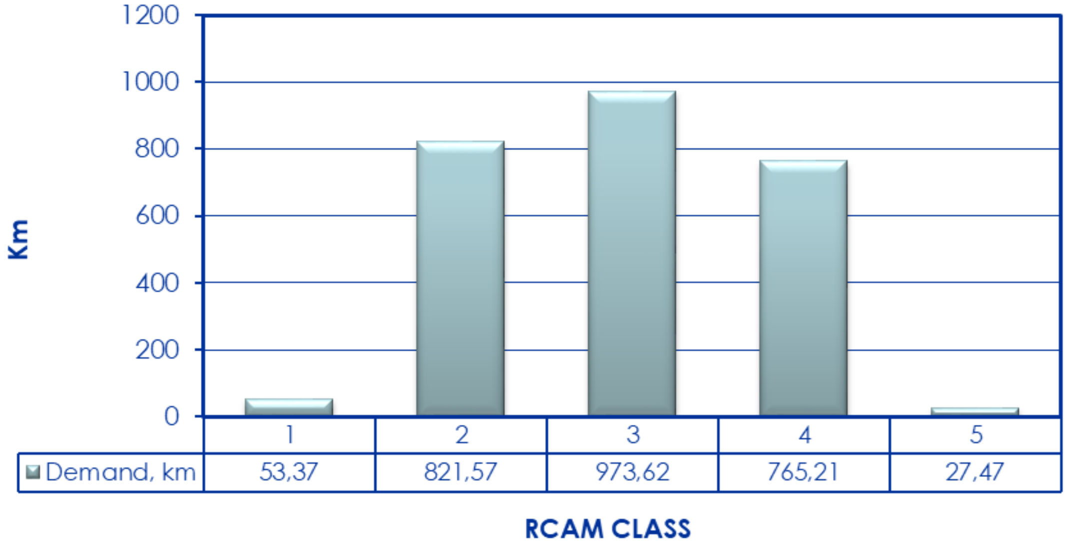


Figure 5-5: Demand for line marking where condition is fair or worse in 2020

5.1.6 Rehabilitation and reconstruction demand

The demand for reconstruction and rehabilitation can be estimated from the remaining life of a road pavement based on the most recent roughness measurements. This method does not take any other distress deterioration into account such as wide cracking or rutting, and therefore underestimates the need. A higher, more realistic rehabilitation need is estimated by the Intervention Budget where a desirable level of service is also taken into account. The rehabilitation need is described in paragraph 5.1.14.

The analysis is based only on roughness data, and indicates that approximately 1 160 km (17,5%) of roads require immediate rehabilitation. This need is based on the 90th percentile of roughness profile measurements. These roads have very poor riding quality conditions and generate excessive costs to road users as well as escalating routine maintenance costs to the Branch. This need was determined purely on roughness thresholds, as defined in TRH 4: Structural design for flexible pavements for interurban and rural roads (Committee of State Road Authorities, 1996), and recorded in Table 3-1. Figure 5-6 shows the lengths of roads not complying with these roughness levels of service and Figure 5-7 shows the distribution of roughness by class of paved road length in 2019.

Figure 5-6: Proportion of paved roads that do not comply with minimum standards for roughness in 2016 based on the 2019 length

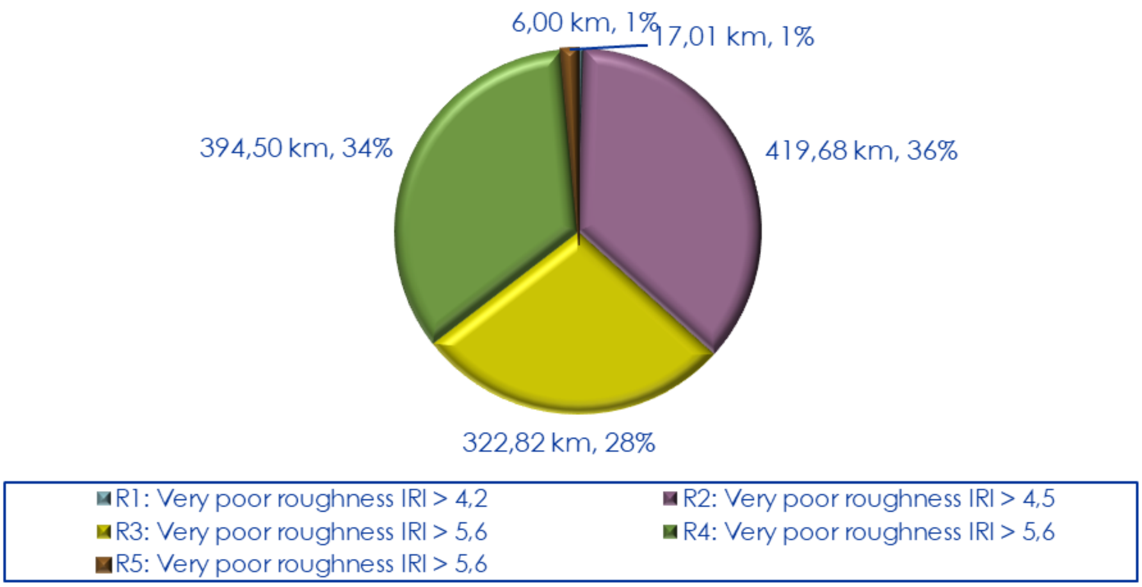


Figure 5-7: Distribution of very poor paved roads according to roughness values in 2016 based on the 2019 length

Figure 5-8 shows the rate of rehabilitation of paved roads and the future needs. Over the last 5 years the average rate of rehabilitation is approximately 118 km per annum, which is 1,6% of the paved network. In contrast, the immediate need based on roughness data alone is 3 235 km (These lengths include Light Rehabilitation road treatment).

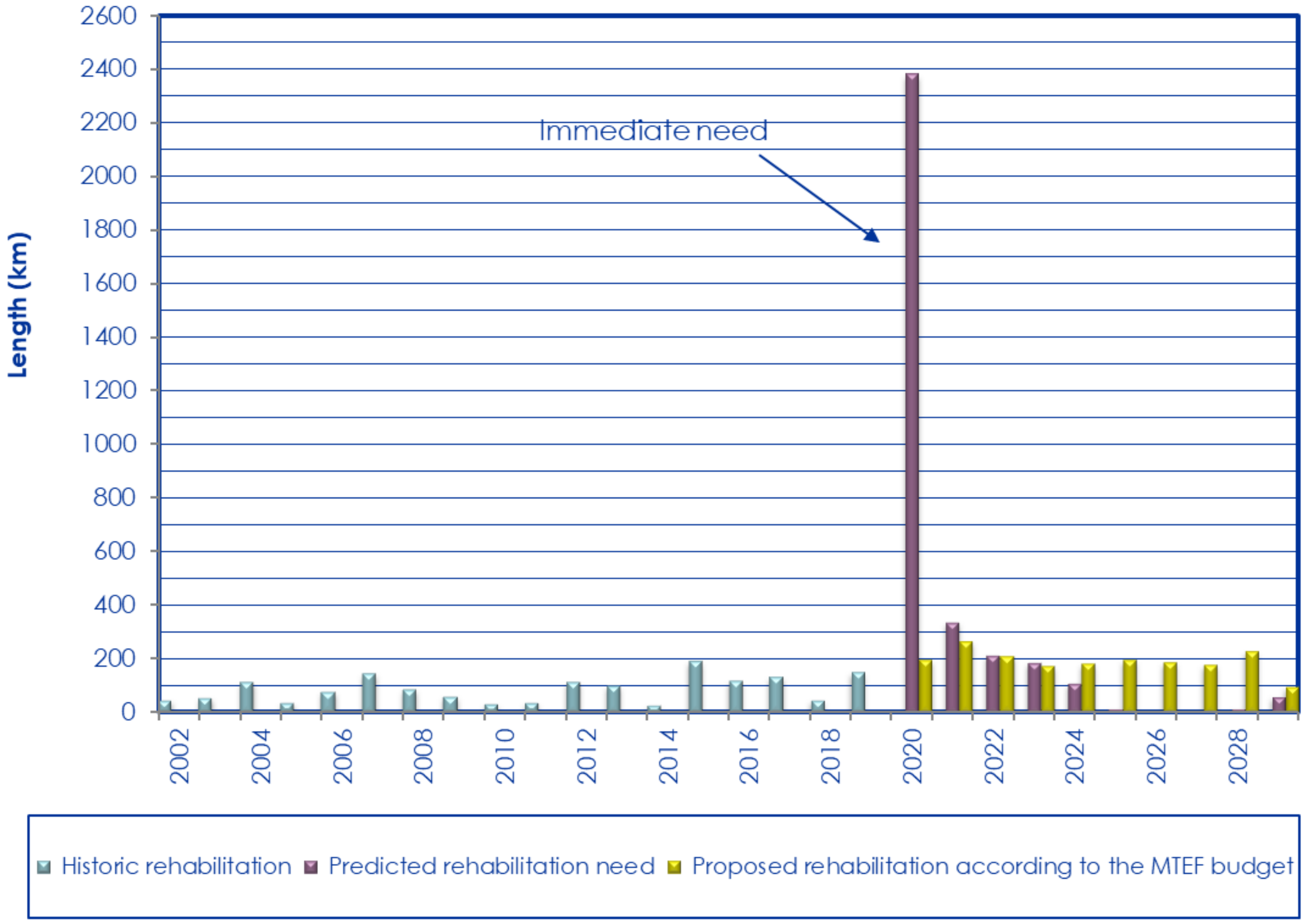


Figure 5-8: Historic rehabilitation of paved roads versus immediate rehabilitation need and proposed intervention of the MTEF budget for 2002 to 2030

5.1.7 Key constraints affecting the maintenance of paved roads

There are three key constraints that affect the maintenance of paved roads, i.e., the supply of:

- Layerworks materials, i.e. crushed stone and natural basecourse, subbase, selected and fill materials;
- Surfacing materials, i.e., crushed stone chips and bitumen; and
- Water for compaction.

Layerworks materials

Road building materials for surfaced roads layerworks have historically been obtained from so-called "borrow pits" (for gravel) and quarries (for crushed stone) that are situated adjacent to the road at optimal distances for construction. The Mineral and Petroleum Resources Development Act (Parliament of the Republic of South Africa, 2002), the National Environmental Management Act and its amendments (Parliament of the Republic of South Africa, 1998), and the regulations pertaining to these Acts severely limits the ability of the Branch to obtain and process suitable materials for layerworks used on the unpaved road network. The natural supply of suitable gravel wearing course materials is also severely limited by the geology of the Western Cape and the manner in which the rocks have been weathered. In recent times, basecourse and subbase materials have increasingly been purchased from commercial quarries, which increases construction costs.

Surfacing materials

As for basecourse materials, the establishment of quarries is very restricted and most of the stone for surfacing is purchased from commercial sources.

Bitumen

The supply of bitumen has been intermittent and there are sporadic shortages often caused by refinery maintenance. With the limited season for resealing, any shortage of bitumen for resealing and asphalt surfacing has an impact on the Branch's ability to optimally maintain the paved road network.

Water for compaction

Water for compaction of layerworks is severely restricted in some areas. The impact of climate change is causing higher temperatures and reduced rainfall that will have an increasing impact on the Branch's ability to rehabilitate and maintain the paved road network.

5.1.8 The demand for replacement of gravel wearing course

Gravel wearing course material is a scarce resource and the investment required to increase the gravel thicknesses is considered in the light of the predicted roughness after the regravelling and the expected savings in road user costs that result from the reduced roughness. If the traffic is low, the benefits may not be commensurate with the costs of regravelling. The unpaved road network has been classified according to four levels of service (Table 3-3) that assist in determining where the regravelling of a road should be a priority. Roads that are classified with low and very low levels of service are maintained by means of spot regravelling and blading, and regravelling longer lengths must be motivated. This analysis method was used for the Technical Needs (Immediate Need) analysis. However, for the MTEF budget the road network was split into economic and non-economic roads, the non-economic gravel roads were only maintained with spot regravelling and blading and the economic roads were maintained with regraveling.

Figure 5-9 shows the regravelling demand compared to the historic replacement of gravel wearing course and the proposed regravelling length of the Branch.

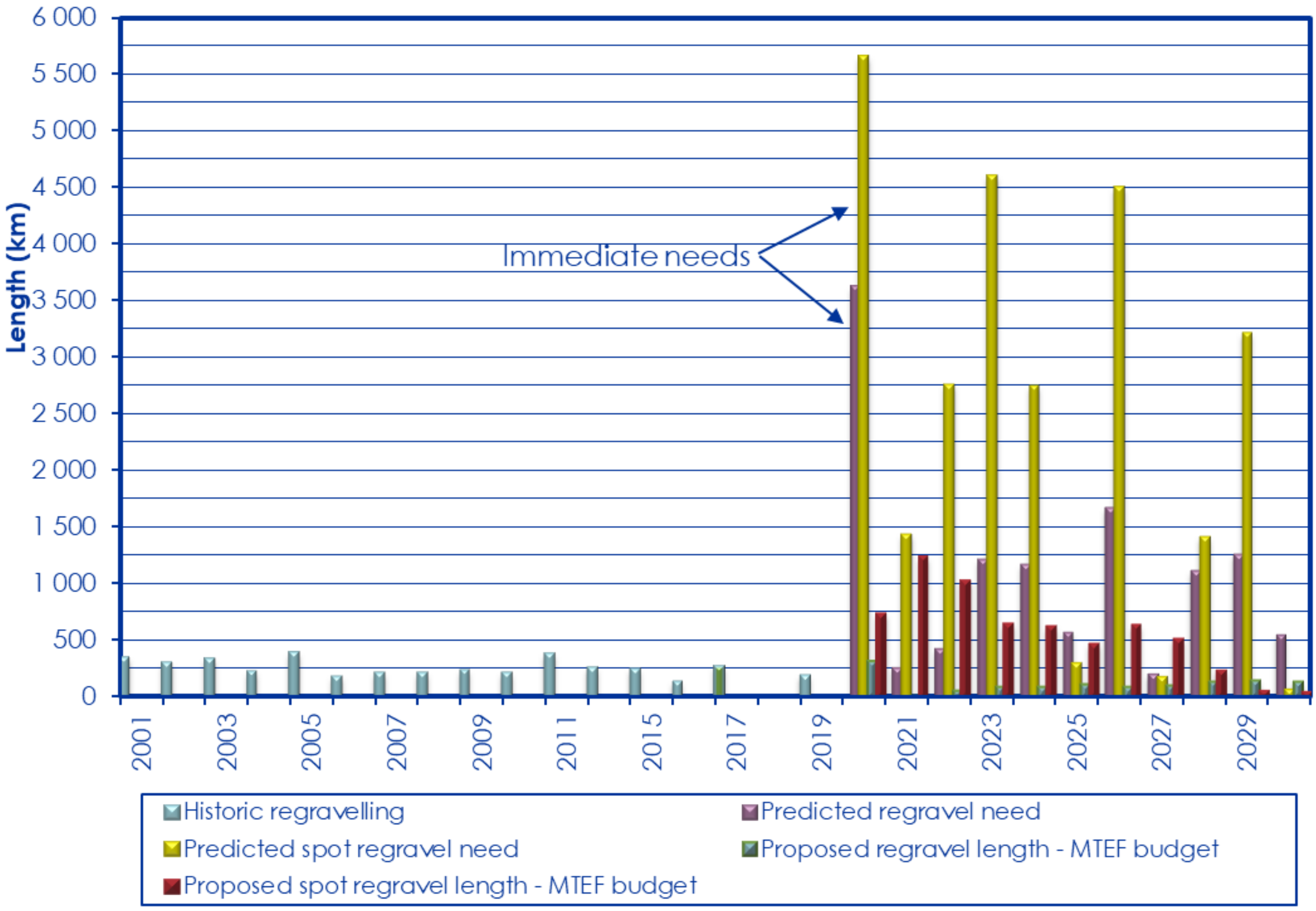


Figure 5-9: Historic regravelling of maintained unpaved roads versus immediate need and proposed intervention of the MTEF budget for 2001 to 2030

Historically, the MTEF funding levels were insufficient to satisfy the need for gravel replacement. At current MTEF budget levels, the Branch can only afford to regravel approximately 312 km and maintain approximately 731 km of roads by means of spot regravelling. Approximately 8 148km (78%) of unpaved roads operate with minimal gravel wearing course materials (below 25 mm). As current funding is insufficient to regravel all 8 148 km of unpaved roads with a minimal gravel wearing course, the maintenance activities for the lower levels of service will consist of mainly spot regravelling. There are many roads that have outcrops of rock that prevent blading maintenance and therefore, in the absence of gravel wearing course, it is practically impossible to maintain these roads to the required level of service.

The presence of clay and sand subgrades influences a road's ability to support traffic loads and the surface smoothness. Unpaved roads having a clayey subgrade and low traffic could therefore provide an adequate level of service without regravelling. Other factors, such as when the road is below ground level and prone to flooding, may necessitate raising the vertical alignment followed by regravelling.

5.1.9 Key constraints affecting the maintenance of unpaved roads

There are two key physical constraints affecting the maintenance of unpaved roads, i.e., the supply of:

- Gravel wearing course; and
- Water for compaction.

Other constraints are the availability of:

- Skilled labour, i.e. plant operators, supervisors and technicians/ technologists; and
- Appropriate and reliable construction plant.

Supply of gravel wearing course

The supply of gravel wearing course is hampered by strict environmental and mining legislation as well as the geology of the Western Cape. The high cost of wearing course from commercial sources renders its use generally economically unfeasible. The use of wearing course from commercial sources is further restricted by high haulage costs because the roads to be regravelled are often far from commercial centres. The majority of available gravel materials lack the plasticity required for the ideal gravel wearing course, requiring the establishment of additional sources of fine, plastic materials to mix with the substandard gravels. Again, these sources of plastic fines, often from dams or rivers, are limited, and their use is often prohibited or severely limited by legislation.

In many areas of the Western Cape, the best materials have already been used and therefore only substandard materials remain. The need to process coarse gravels to break them down to a suitable grading is also becoming more common. The use of grid rolling has not always been successful and it will become increasingly necessary to resort to the crushing of materials and mixing them with plastic fines. Screening of hard gravels to waste is an additional process often required. Without a full environmental impact assessment, it will not be possible to crush material in a borrow pit, adding additional uncertainty and cost to the processing of the gravel in a borrow pit. Alternative methods are being investigated, eg the crushing of coarse/oversize materials on the road with an in-line crusher.

The number of borrow pits to maintain the gravel road network had historically been based on a borrow pit spacing of 30 km, resulting in a total number of about 350 borrow pits for the network. The cost to establish this number of borrow pits is estimated at R262 million (R750 000 per borrow pit). Another reality that needs to be considered is that borrow pits have a limited life and need to be replaced when mined out.

The cost of establishing a borrow pit varies because of the number of variables involved in the approval process, e.g. location, geology, ownership, land use and environmental, botanical and heritage impacts. Due to the large investment the Branch has made to date into the sourcing of gravel wearing course, a decision was made to use the currently approved borrow pits for roads that are a practical distance from the pits. Investigation of new borrow pits has been delayed until such time that the borrow pits in the process of approval have been through all approval processes. Some is awaiting approval from DMR after financial guarantees, was submitted. The remaining borrow pits that are in other legal approval processes, will be mined when all approvals has been received. The total number of legalised borrow pits will be in excess of 150, once these processes have been completed.

Water

The availability of water for compaction is expected to decline as climate change accelerates. There will consequently be a significant impact on the Branch's ability to maintain the unpaved road network. Investigations are currently under way to determine the possibilities of using sea water along the coast and mineralised water in inland areas. There will be an extra, as yet undetermined cost, in establishing the inland sources of water. These costs relate to the environmental approvals required as well as drilling, pumping and temporary storage costs.

5.1.10 Effect of climate change on demand

The need to build resilience to climate change was identified in paragraph 4.11 Climate change impact To date there is no strategy in place to identify where additional resilience measures are justified, and the nature and cost of these measures, which will affect demand in many different ways. As noted previously, a drier climate will affect the supply of water for roadworks, perhaps increasing the cost. The incorporation of the effects of climate change on the identification and prioritisation of projects has not yet been tackled.

5.1.11 Demand prioritisation and resource allocation

The priorities for meeting the desired Branch Strategic Objectives to provide an efficient and effective road network in support of growth and development are applied to the candidate project list. The Deighton Total Infrastructure Management System is used for this purpose, which currently facilitates the trade-off analysis between rehabilitation, upgrades of unpaved roads and periodic maintenance.

The planning process for capital projects is represented diagrammatically in Figure 5-10 as a funnel through which the pool of candidate projects flow to become scheduled programmes of projects.

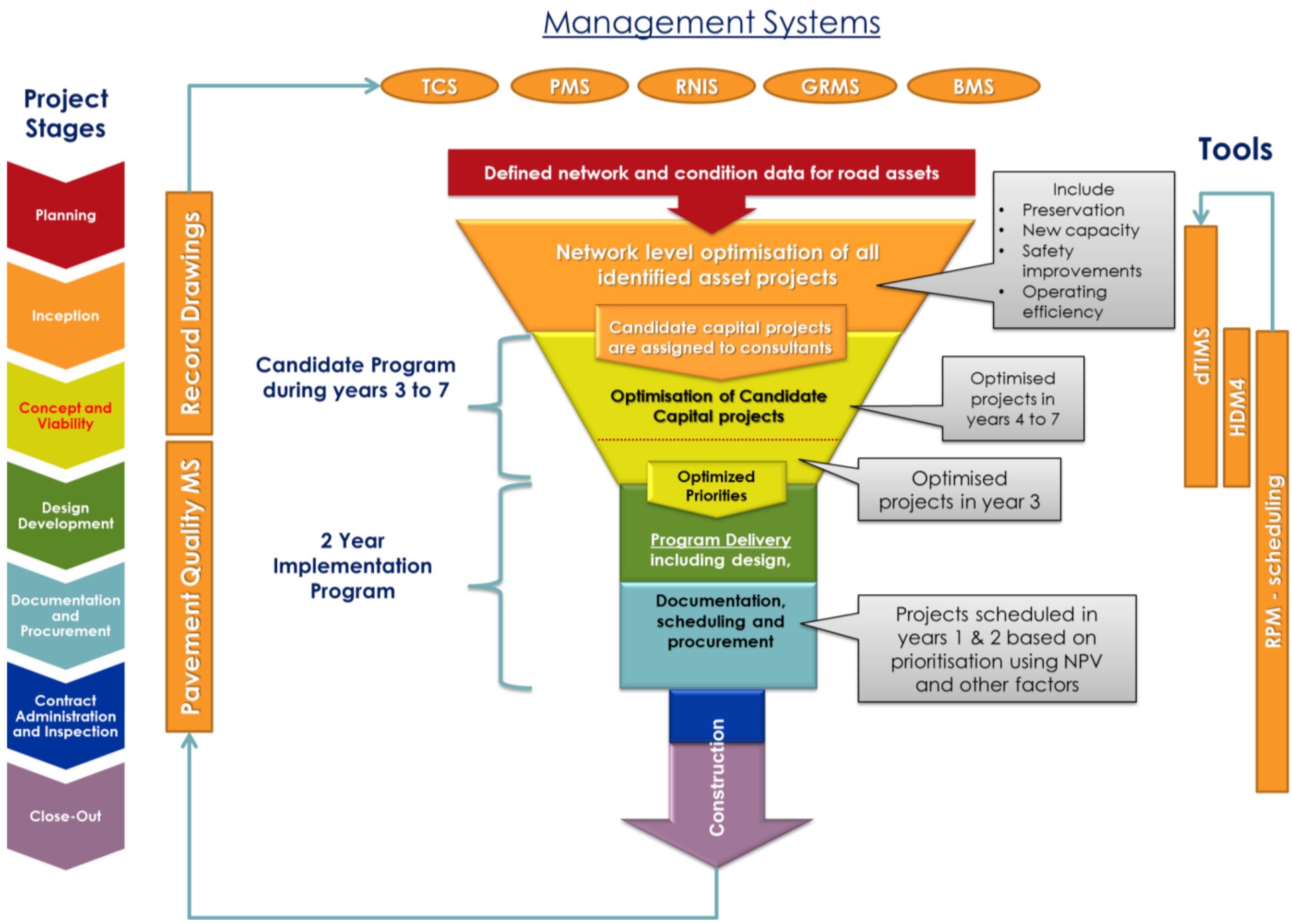


Figure 5-10: Process for capital projects from identification to construction

5.1.12 Background to the lifecycle benefit-cost analysis

The decision support system for optimal resource allocation, called Deighton Total Infrastructure Management System from Deighton Associates, Canada, was customised for the Branch to conduct a lifecycle benefit-cost analysis (LCBCA) on its paved and unpaved road networks. The dTIMS software was developed specifically for the management of linear infrastructure assets, adopting the heuristic optimisation methodology (also called near optimisation) to find optimal solutions under constrained resources, usually funding. This methodology is also used in HDM-4 for a more detailed project-level analysis.

According to Deighton, optimisation in dTIMS can be described as follows:

"Optimisation chooses the strategies that maximise the outcome, defined by the user, while adhering to a set of constraints such as budget or minimum level of service. It can be defined as a tool within a good Pavement Management System that provides you with quantitative feedback and suggestions, ultimately

allowing you to knowingly revise a program by using your judgment to weigh political, engineering and economic factors."

Previously, the selection of intervention activities was based on pavement condition, a decision tree and engineering judgement. While this decision methodology includes other criteria such as traffic and road classification, it does not provide solutions that are optimised to a specific objective function that reflects the strategic objectives of the Branch and includes performance modelling, strategic analysis, network level consequence performance, and LCBCA. The latter forms the basis for optimisation in the dTIMS software, namely the ability to analyse the incremental benefit of alternative intervention activities, at different cost levels.

According to the draft TMH 22 (Committee of Transport Officials, 2013), "*analysis systems are used to process and analyse data in order to provide decision support to asset managers*". Robertson (Robertson, 2004) classified analysis systems into six decision support levels (DSLs) in terms of the characteristics and sophistication of the analysis process (Table 5-2). DSL1 and DSL2 are typically based only on technical parameters. DSL3 and higher are "economy based", requiring lifecycle cost analyses.

Table 5-2: Classification of decision support levels for RAMS

Decision support level	Dominant characteristic
1	Basic asset data, rule-based work allocation
2	Project and network level assessment, geographic reference
3	Life cycle cost analysis (LCCA) of authority impacts, i.e. capital and maintenance costs
4	LCCA of authority and user impacts, economic prioritisation
5	Optimum investments within constraints, sensitivity analysis
6	Economic, social, environmental multi-criteria assessment, risk analysis

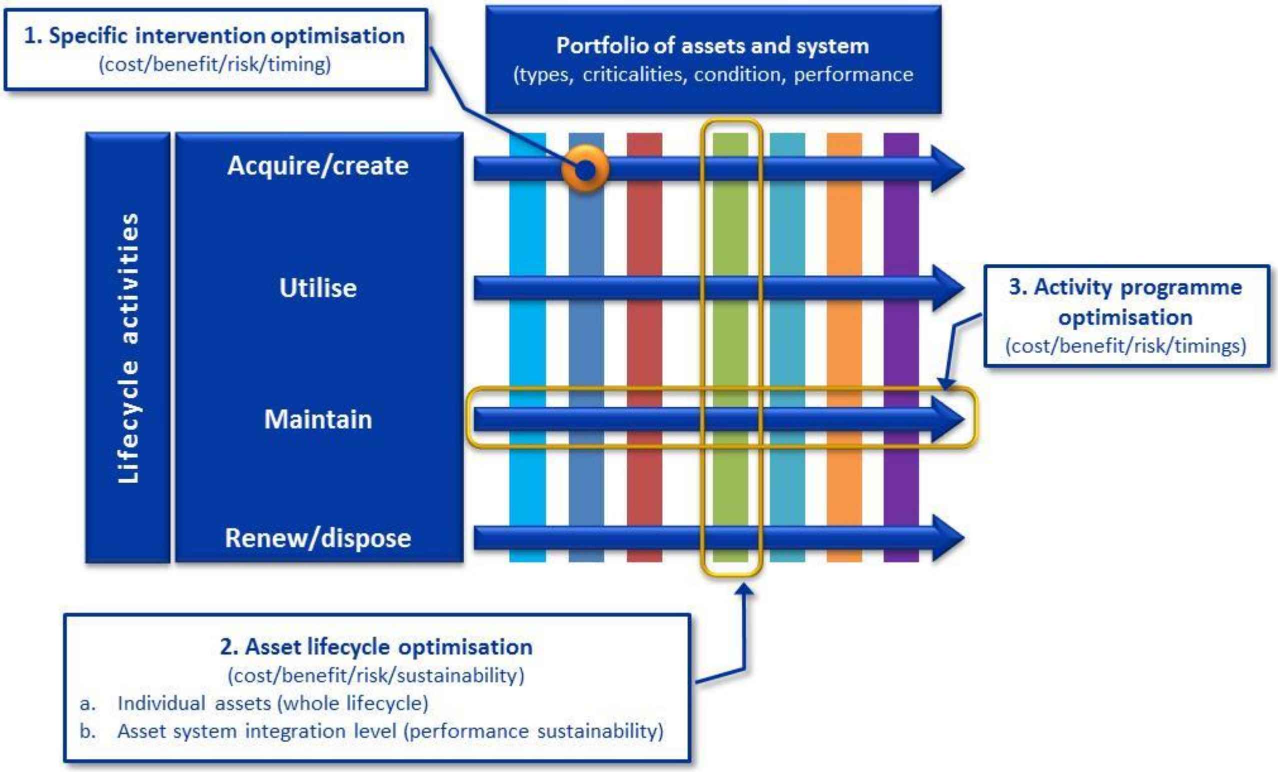
The Deighton dTIMS software was used to conduct the LCBCA to determine the long-term consequences of the current expenditure levels on the Western Cape road network. dTIMS has decision support capabilities up to DSL6 (Committee of Transport Officials, 2013), but is currently being applied at DSL5 in the Branch.

Optimisation levels and methods

Three levels of optimisation, as required by PAS 55 (Institute of Asset Management, 2004), the forerunner of SANS 55001:2015/ISO 550001 (International Standards Organization for Standardization, 2015), are included in dTIMS:

- Specific intervention – dTIMS uses the efficiency frontier method (the set of optimal treatments that offers the highest expected return for a defined capital investment. Treatments that lie below the efficient frontier are sub-optimal, because they do not provide enough return for the invested capital. Portfolios that cluster to the right of the efficient frontier are also sub-optimal, because they have a higher cost for the defined return).
- Asset lifecycle – dTIMS uses the efficiency frontier method.
- Activity programme – dTIMS identifies sections to generate an activity programme of road sections after which a stand-alone system (developed in Excel) combines these activities into larger candidate projects. Candidate projects are aggregated to ensure project length is maximised to achieve economy of scale efficiencies. The candidate projects are then re-distributed over a 5-year period based on the net present value (NPV) of the dTIMS optimised objective function and ensures that the fund allocation is consumed according to availability per year.

These levels of optimisation (British Standards Institute, 2008) are illustrated in Figure 5-11.



Asset management - whole-life management of physical asset (Lloyd, 2010)

Figure 5-11: Three levels of optimisation required in asset management decisions

The dTIMS software has been calibrated to model the deterioration and maintenance effects of roads in the Western Cape. Future paved road performance is modelled by the HDM-4 models in terms of cracking, rutting, ravelling, potholes and road roughness. Models developed by the CSIR are used for modelling gravel loss and road roughness. For any given fund allocation, the software selects maintenance, rehabilitation and upgrading alternatives to maximise the overall benefit to the network.

The activities investigated in this lifecycle benefit-cost analysis optimisation are listed below:

- regravelling;
- resealing;
- light rehabilitation - The inclusion of the Light Rehabilitation treatment adds a holding action (for constraint budgets) and roads that has passed reseal is prevented of deteriorating to rehabilitation. Light rehabilitations cost is 40% of Rehabilitation cost;
- rehabilitation (reconstruction is included with rehabilitation); and
- upgrading of unpaved roads to paved standards.

The budget portions excluded from this analysis are the budget values for the following items:

- programme support;
- access improvements;
- new facilities;
- capital improvement projects (paved road upgrading);
- transfers to municipalities;
- routine maintenance; and
- maintenance of bridges.

5.1.13 Specifications of the LCBCA

Assumptions and limitations

The LCBCA is based on a number of assumptions and limitations. These include:

- All consequences derived from analysing the MTEF funding scenarios in this report are based on the assumed funding levels.
- The prediction model for gravel loss is not very accurate as the original formulation by Dr Paige-Green was based on the road network in northern South Africa. The HDM-4 model calibrated to Western Cape conditions is envisaged for future implementation.
- The HDM-4 deterioration models have been calibrated for a rural network. However, there are four very important urban roads in the Cape Metropolitan Region, namely TR9/1, TR27, TR11/1 and TR2/1, for which the calibrations are inadequate. For these roads, other factors, such as congestion, the variable pavement structure and asphalt surfaces, have a large influence on the optimisation of periodic maintenance and upgrades, especially the timing of treatments. A detailed asset management plan for this sub-network is envisaged. Details of the projects will then be included in dTIMS.
- The reconstruction treatment is a subset of rehabilitation.

Objective function used for preservation of the uneconomic network

The area-under-the-condition curve (AUC) objective function was used for the analysis of the road network to determine the priority needs for the road network. Figure 5-12 illustrates the area-under-the-condition curve pictorially.

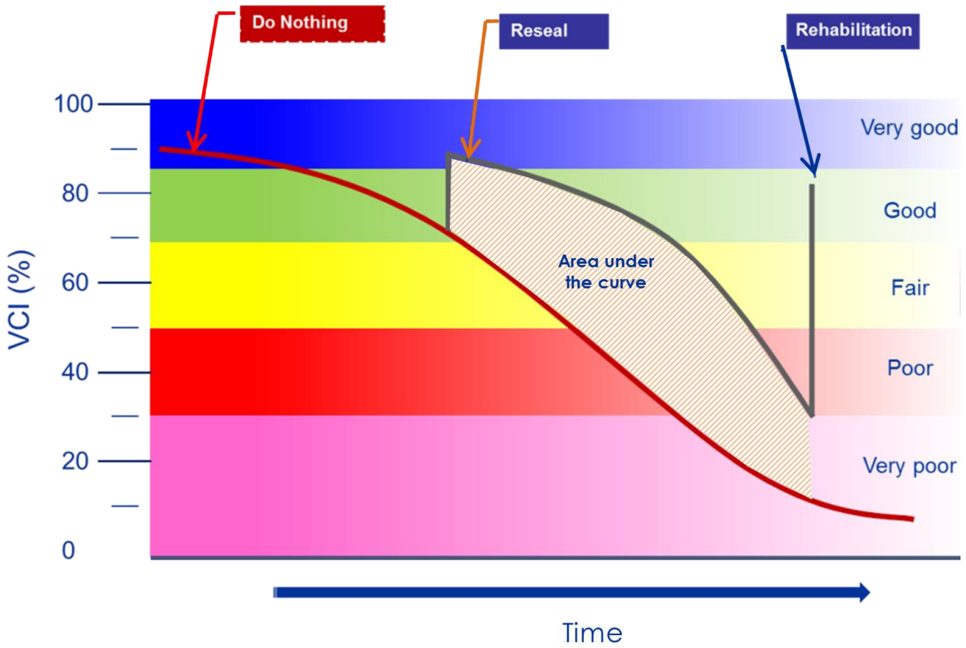


Figure 5-12: Illustration of Area-Under-the-Condition Curve

For each strategy, the benefit is calculated for each year in the analysis period, weighted by AADT and totalled for the analysis period. In theory, the 'benefit' is the area between the two curves, weighted by traffic. Any repair strategy that improves the condition of the road segment would thus result in a positive area above the 'do nothing' curve. During the optimisation analysis, the incremental benefit of alternative intervention strategies with increasing costs are measured in terms of the area-under-the-condition curve.

This method is can be applied to both high and low trafficked roads, thus complying with the objective of preservation of the Branch Road Network.

The AUC objective function is calculated by summing the present value of the difference between the condition index resulting from the intervention strategy (a combination of intervention activities over the analysis period) and the condition index for the do-nothing alternative, for each year in the analysis period. The area-under-the-condition curve benefit calculations are weighted by traffic (AADT).

The equation to calculate this benefit for an intervention strategy on a road segment is:

$$Benefit = \sum_{i=1}^{TotYears} AADT_i \, (IS\_Cond_i - DN\_Cond_i)$$

Where:

Benefit = Benefit of an Intervention Strategy for a road segment
TotYears = Total number of years in the analysis period
i = Year in the analysis period
IS_Cond_i = Condition of the road segment for the Intervention Strategy in year i
DN_Cond_i = Condition of the road segment for the Do Nothing Strategy in year i
$AADT_i$ = AADT on the road segment in year i

The Branch is currently investigating alternative methods for the LCBCA and conducting this in parallel for comparative means. Any major changes to the LCBCA will only be done after a multiple year comparison. This investigation includes an "augmented" area-under-the-benefit-curve (AAUC) objective function developed by the Branch. Details of the development of AAUC objective function is presented in Appendix G.

Discount rate

A discount rate of 8% is used for analysis.

Financial inflation

No financial inflation was incorporated into the analysis.

Performance prediction models

The HDM-4 pavement performance prediction models are used to predict the deterioration of paved roads on the network. This paragraph explains how and where the HDM-4 models are incorporated into the Branch's dTIMS analyses.

The HDM-4 software contains seven items within its workspace. These are:

1. Vehicle fleets;
2. Road networks;
3. Work Standards;
4. Projects;
5. Programs;
6. Strategies; and
7. Configuration.

Table 5-3 presents how the HDM-4 models were incorporated within dTIMS.

Table 5-3: Incorporation of HDM-4 models into dTIMS			
Part	**Description of functionality customised in dTIMS**	**Source/ incorporation of HDM 4 models and methodology within dTIMS**	**Comments and parallel with HDM-4**
A	Database containing the road network and network information data, most recent assessment data, traffic data, committed projects and pavement structure data.	• Data necessary for the analysis and based on the HDM-4 methodology is obtained from the Branch's RNIS. • dTIMS is open-ended and any number of data attributes can be stored and used in an analysis.	• Item 2 (Road networks) of HDM-4's workspace is used to import and store the road network and its associated data attributes. • For an analysis in HDM-4, the source of data would also be the RNIS of the Branch. • dTIMS is open-ended and has no limitation on the data fields that are used in the analysis. In contrast HDM-4 has a defined set of data attributes and does not make provision for additional attributes to be used in the analysis. For example, it is simpler in dTIMS to conduct a differentiated needs analysis where intervention criteria are varied according to road class or region.
B	Calibrated pavement performance/ deterioration models for paved and unpaved roads	• The HDM-4 manuals (specifically Volume 4), contain comprehensive model descriptions of all pavement performance models and their associated input data, coefficients and calibration factors. The formulae of these models were captured in dTIMS. • The HDM-4 formulae of each pavement performance distress such as all cracking, roughness, rutting, etc. have calibration factors to adjust the predicted performance to local performance. The calibration factors determined for the Western Cape are captured and updated in the Branch's dTIMS system. • Additional models that are not part of the HDM-4 methodology are also customised in dTIMS. These are the calculation of asset values and composite condition indices.	• The pavement performance models of HDM-4 were captured within the HDM-4 software by the HDM software developers. The models cannot be viewed/ changed by the software users but they are detailed in Volume 4 of the HDM-4 manuals. • Item 7 (Configuration) of HDM-4's workspace is used to enter the calibration factors.
C	Vehicle operating cost models	• The relationship between road roughness, terrain and vehicle operating costs is obtained from HDM-4. Prior to each analysis, Aurecon obtains the updated relationship according to HDM-4 from WCG's website https://axs.pgwc.gov.za/axs/axs.main	• Item 1 (Vehicle fleets) of HDM-4's workspace is used to enter the basic characteristics and economic unit costs of the network fleet. • Similar to B above, the road user effects models

Table 5-3: Incorporation of HDM-4 models into dTIMS			
Part	**Description of functionality customised in dTIMS**	**Source/ incorporation of HDM 4 models and methodology within dTIMS**	**Comments and parallel with HDM-4**
		. This website was developed from HDM-4's Road User Effects, described in Volume 4 of the HDM-4 set of manuals. • The economic unit costs are updated via the website.	of HDM-4 were captured within the HDM-4 software by the software developers. The models cannot be viewed/ changed by the software users but they are detailed in Volume 4 of the HDM-4 manuals.
D	Aurecon's asset value model for calculating the current and future predicted asset values. Also models for the calculation of composite indices incorporating all HDM-4 models.	• This is Aurecon's methodology. HDM-4 does not make provision for calculation of asset values nor composite indices.	Not applicable
E	Intervention treatments. Their effects and unit costs.	• Customised according to Branch requirements. • dTIMS is open-ended and can accommodate any number and type of treatments. • The user has full control over the effect of intervention treatments. Note 1 has details on studies conducted for the Branch to refine the effect of treatments (reset values).	• Item 3 (Works Standards) of HDM-4's workspace is used to enter the intervention treatments, and their unit costs. • The user has limited control over the effect of intervention treatments in HDM-4.
F	Budget scenarios and maintenance policies to be investigated.	• Customised according the Branch requirements. Both dTIMS and HDM-4 can accommodate any number of budget/ policy scenarios to be optimised. • Multi-year road maintenance, rehabilitation and upgrading plans are generated with ease.	• Items 6 and 7 (Programmes and Strategies) are used to conduct network level analyses. • Multi-year road maintenance, rehabilitation and upgrading plans (Item 6 Programmes) can be generated for a sub-network of candidate projects. Experience has shown this cannot be achieved for a large road network with many road segments to be analysed.
G	Objective functions for optimisation (e.g. minimization of transport costs, or maximisation of condition thus preservation of road network as an asset)	• Customised according the Branch requirements. dTIMS can accommodate any objective function inclusive of the objective functions built into HDM-4. • For the Branch analyses, two objective functions are incorporated namely maximising condition (AUC) and minimising TTC.	• Objective functions are selected in items 6 and 7 (Programmes and Strategies). • Only three objective functions can be used: Minimise NPV, maximise IRI, minimise cost.

Note 1

The following reports and papers, pertaining to the incorporation of the HDM-4 models into the decision support system, were prepared by Aurecon (previously Africon) for the Branch:

- HDM-4 calibration study for the Western Cape Government: based on Long Term Pavement Performance Maintenance System (LTPPMS) data from 1995 to 2013.
- Study 1: Preliminary Evaluation of the HDM Road Deterioration Models for the Western Cape Road Network, May 2006. Authors: I Wolmarans and J Viktor.
- Study 2: Further Investigation of the Calibration Data and Performance Modelling of the Road Network of the Western Cape, September 2007. Authors: I Wolmarans and J Viktor. This study consisted of various tasks pertinent to the LTPPMS and its application:
  - Determine how effective the HDM-4 models (calibrated for the Western Cape) are in the prediction of the network's condition over a long period. The outcome of this analysis was the comparison of the observed condition parameters in 2006 (based on the 2006 road condition survey data) against the predicted condition parameters in 2006 (based on the calibrated HDM-4 Road Deterioration models with performance predicted from 1996 to 2006).
  - Perform calibration study to determine new calibration factors for the HDM-4 Road Deterioration models of the Western Cape based on LTPPMS.
  - Investigate the observed effects (Works Effects) of the different maintenance and rehabilitation activities to improve the treatment reset values of the HDM-4 models for Western Cape.
  - Investigate the distress types for cracking that are typically collected according to the TMH 9 visual condition assessment methodology of South Africa. Determine TMH 9-crack types to be converted to HDM-4 units and update formulae to convert the TMH 9 distress ratings to HDM-4 units for network level analyses.
  - Note 1 *continued*
  - Scrutinise the calibration data for the Western Cape on a LTPPMS by LTPPMS basis to determine the relevance of each section after more than ten years of data collection. Furthermore, other influencing data such as traffic and pavement information were investigated for currency and accuracy.
- Road Deterioration Calibration study and report, based on LTPPMS data from 1995 to 2004, June 2005.
- Road Deterioration Calibration study and report, based on LTPPMS from 1995 to 2002, 2003.
- Bi-annual reports on the "Strategic analysis of the Western Cape road network with the objective to preserve the road network". These reports are based on the calibrated HDM III and HDM-4 Road Deterioration, Works Effects and Road User Effects models included in the dTIMS™ CT decision support system of the PMS and have been in use since 1999. One of these reports was also presented at the Annual Deighton Users' Conference in Canada, 1997.
- Visual assessment manual for the calibration of HDM-III / IV. 1996.

Calibrated HDM-4 models

Calibration factors are used to fit the models to the conditions in the Western Cape. The most recent factors are listed in Appendix I – Calibration factors for modelling performance, and are sourced from the HDM-4 calibration study performed in 2013 (Aurecon, 2013) for the WCG Roads Branch.

A review of the calibration of the HDM-4 models have commenced in the year 2020.

Unpaved roads deterioration models

The steady state prediction models, developed by Dr P Page-Green of the CSIR (Page-Green, 1996), are used for the prediction of gravel loss and roughness on unpaved roads.

Triggers used to identify treatments

The triggers are summarised in Table 5-4 for paved roads and in Table 5-5 for the unpaved roads.

Table 5-4: Triggers for paved roads			
RCAM Classes 1 & 2	Weighted average area of Wide Cracks ≤10%		Wide Cracks >10%
	All Cracks ≤2,5% and Reseal Condition Index >50%	All Cracks >2,5% or Reseal Condition Index ≤50 %	
P90 Roughness ≤4,2 IRI or Condition Index ≤55%	No Maintenance	Reseal	Light Rehabilitation / Rehabilitation
P90 Roughness >4,2 IRI or Condition Index >55%	Light Rehabilitation / Rehabilitation	Light Rehabilitation / Rehabilitation	Light Rehabilitation / Rehabilitation
	Reconstruction[1]	Reconstruction[1]	Reconstruction[1]
RCAM class 3	Weighted average area of Wide Crack ≤10%		Wide Cracks >10%
	All Cracks ≤2,5 % and Reseal Condition Index >50%	All Cracks >2,5% or Reseal Condition Index ≤50 %	
P90 Roughness ≤4,5 IRI or Condition Index ≤53%	No Maintenance	Reseal	Light Rehabilitation / Rehabilitation
P90 Roughness >4,5 IRI or Condition Index >53%	Light Rehabilitation / Rehabilitation	Light Rehabilitation / Rehabilitation	Light Rehabilitation / Rehabilitation
RCAM classes 4 & 5	Weighted average area of Wide Crack ≤10%		Wide Cracks >10%
	All Cracks ≤2,5% and Reseal Condition Index >50%	All Cracks >2,5% or Reseal Condition Index ≤50 %	
P90 Roughness ≤5,6 IRI and Condition Index ≤45%	No Maintenance	Reseal	Light Rehabilitation / Rehabilitation
P90 Roughness >5,6 IRI and Condition Index >45%	Light Rehabilitation / Rehabilitation	Light Rehabilitation / Rehabilitation	Light Rehabilitation / Rehabilitation
Note 1: If Remaining Life is <5 years and Structural Number is <2,5			

Table 5-5: Triggers for unpaved roads		
Level of Service (LOS)	Gravel Thickness <50 mm	Gravel Thickness ≥50 mm
Very Low	Spot Regravel	No Maintenance
Low	Spot Regravel	No Maintenance
Medium	Regravel or Upgrade to Paved Standard[1]	No Maintenance or Upgrade to Paved Standard[1]
High	Regravel or Upgrade to Paved Standard[1]	Upgrade to Paved Standard[1]
Note 1: Depending on economic rates and budget		

Analysis period

10 years.

Analysis procedures

- Values of future predicted costs and budgets are not inflated and all rand values in this document correspond to the buying power of the rand in 2019.
- The budget components of rehabilitation, upgrades, and preventive maintenance activities are investigated in the optimisation analysis. The remainder of the budget is for items not directly associated with pavement deterioration and is not considered in this analysis. The current funding for regraveling, resealing, rehabilitation and upgrading of unpaved roads to paved roads are combined and reallocated to minimise total transport costs and loss in asset value. The result is an optimised allocation of the MTEF funding scenario.

- The funding levels for normal maintenance, new assets, upgrade to surfaced roads and other overhead items in the MTEF budget were not investigated.
- The intervention levels used to calculate the Intervention Funding Scenario are listed in Table 5-6.

<table>
<tr><th colspan="5">Table 5-6: Intervention levels</th></tr>
<tr><th rowspan="2">RCAM class</th><th colspan="2">Paved roads</th><th colspan="2">Unpaved roads</th></tr>
<tr><th>Riding quality Max IRI (m/km)</th><th>Condition[1] Min (%)</th><th>Level of Service[2] to regravel at 50 mm</th><th>Level of Service[2] to spot regravel at 50 mm</th></tr>
<tr><td>1</td><td>4,2</td><td>55,0</td><td></td><td rowspan="3"></td></tr>
<tr><td>2</td><td>4,2</td><td>55,0</td><td rowspan="2">Medium and High</td></tr>
<tr><td>3</td><td>4,5</td><td>52,5</td></tr>
<tr><td>4</td><td>5,6</td><td>45,0</td><td rowspan="2"></td><td rowspan="2">Low and Very Low</td></tr>
<tr><td></td><td>5,6</td><td>45,0</td></tr>
<tr><td colspan="5">Notes
1. Condition refers to the overall visual condition index as defined in draft TRH 22.
2. Roads were classified by level of service and intervention level. The intervention level for replacement of gravel material is 50 mm.</td></tr>
</table>

- For this intervention scenario, the objective of the analysis was to maintain the overall NCN of paved roads at approximately 70% while maintaining the proportion of poor to very poor roads below 10%. For unpaved roads, the objective is to maintain all gravel roads with a minimum gravel wearing course thickness of 50 mm except for those unpaved roads in the low and very low level of service classification, which will be maintained with spot regravelling.
- For the Intervention scenario, the objective of the analysis was to maintain the majority of paved roads within the tabulated intervention levels for the next 5 years. For unpaved roads, the objective is to achieve the intervention levels within the next 10 years.
- For the rehabilitation of trunk roads, the cost of rehabilitation was based on the current width.

The effect of a deteriorating paved road network versus routine maintenance has also been quantified—see paragraph 5.2. Other relevant observations are:

- The quality of the traffic data meets best practice requirements in terms of collection and processing.
- Traffic levels play an important role when projects are scheduled during the optimisation process. All assumptions of future traffic levels in the Western Cape are based on historic trends extracted from the Traffic Counting System.

Unit rates used in the analysis

Unit rates are used to estimate the cost of the intervention activities, called treatments, which are investigated in this analysis. In order to determine the effective amount of work that can be accomplished for a given allocation of funds, it is necessary to determine unit rates for doing fixed portions of work. The unit rates adopted in this report were derived from the latest projects undertaken in the province. During this analysis the unit rates for rehabilitation are uniquely defined for each road segment according to its current condition. The rehabilitation costs were further adjusted to account for mountainous terrain, where the estimated rehabilitation cost is increased by 30%.

The unit rates in Table 5-7 were used in the analysis to determine the extent of work that can be achieved for each funding level.

Network

The following network was used in the analysis:

- All trunk, main and divisional roads investigated, i.e. 16 150 km. Subsidised municipal main roads are excluded from the analysis.
- The minor roads (15 565 km), except for a few exceptions (845 km) that carry high levels of traffic, are not included in the lifecycle benefit-cost analysis, because these roads are not cost-effective to maintain. Traffic volumes on the minor roads are very low, and it is estimated that less than 1% of the province's traffic use these roads.

Data

The data used in the analysis are as follows:

- The visual survey data of 2018 for both paved and unpaved roads;
- The 2016 high speed roughness and transverse profile measurements;
- Traffic information from the Traffic Counting System in 2019;
- The latest models for calculating the cost to the road user in terms of vehicle operating costs (detailed in Appendix I – Calibration factors for modelling performance); and
- The funding levels of the MTEF budget as at February 2019.

<table>
<tr><th colspan="7">Table 5-7: Historic and current unit rates of maintenance actions modelled</th></tr>
<tr><th>Treatment Type</th><th>Rates 2012/13</th><th>Rates 2014/15</th><th>Rates 2016/17</th><th>Rates 2017/18</th><th>Rates 2018/19</th><th>Rates 2019/20</th></tr>
<tr><th>Regravelling</th><th colspan="6">Rx1000/km</th></tr>
<tr><td>Regravel</td><td>300</td><td>330</td><td>345</td><td>6 m - 772</td><td>6 m - 772</td><td>6m - 767</td></tr>
<tr><th>Resealing and Rehabilitation</th><th colspan="6">R/m^2</th></tr>
<tr><td>Resealing</td><td>140</td><td>191</td><td>215</td><td>200</td><td>200</td><td>225</td></tr>
<tr><td>Light Rehabilitation</td><td>-</td><td>-</td><td>-</td><td>301</td><td>301</td><td>382</td></tr>
<tr><td>Rehabilitation[2]</td><td>-</td><td>-</td><td>848</td><td rowspan="8">829</td><td rowspan="8">829</td><td rowspan="8">962</td></tr>
<tr><td>Rip, stabilise base and seal</td><td>320</td><td>442</td><td>442</td></tr>
<tr><td>Rip, stabilise base as subbase, add base and seal</td><td>644</td><td>890</td><td>890</td></tr>
<tr><td>Add new base and seal</td><td>627</td><td>865</td><td>865</td></tr>
<tr><td>Asphalt overlay</td><td>422</td><td>582</td><td>582</td></tr>
<tr><td>Rip, rework and stabilise base and asphalt overlay</td><td>615</td><td>845</td><td>845</td></tr>
<tr><td>Remove base, stabilise subbase, replace base, stabilise and seal</td><td>431</td><td>595</td><td>595</td></tr>
<tr><td>Reconstruction</td><td>1 120</td><td>1 551</td><td>1 551</td></tr>
<tr><th>Upgrading</th><th colspan="6">R millions/km</th></tr>
<tr><td>Upgrading unpaved roads to paved standards</td><td>4</td><td>5</td><td>6,9</td><td>10,8</td><td>10,8</td><td>11,45</td></tr>
<tr><td colspan="7"><u>Note</u>
1. Spot regravelling on unpaved roads classified as Low and Very Low LOS roads is done at a cost of 10% of the cost to regravel the entire road length
2. Rehabilitation cost in mountainous terrain is increased by a further 30%</td></tr>
</table>

5.1.14 Historical budget context

Limited resources continue to constrain the Branch's core function of providing optimal road infrastructure. Backlogs in road infrastructure provision and maintenance continue to grow. The backlog in regravelling, resealing and rehabilitation (including reconstruction) of paved roads and the upgrading of unpaved roads to paved roads, has been estimated since 1999. The rapid increase in this backlog is evident from Table 5-8 and Figure 5-13.

Table 5-8: The backlog in rehabilitation, resealing of paved roads and the regravelling and upgrading of unpaved roads to paved standards

Financial Year	Backlog (Rand million)	Backlog adjusted for 2019 rands (Rand million)	Budget shortfall as a ratio of annual budget[1]
2001/02	1 169	3 145	1,3
2003/04	2 140	5 757	2,4
2005/06	2 573	6 253	2,6
2007/08	3 535	7 792	3,2
2009/10	5 465	9 714	4,0
2012/13	7 044	10 017	4,2
2014/15	10 124	12 854	5,4
2016/17	21 724	24 409	10,2
2017/18	23 700	26 629	11,1
2019/20	24 234	25 688	10,7
2020/21	26 502	26 502	11,0

Note 1: This shortfall is determined by dividing the 5-year average annual budget (Table 5-13) into the Technical Needs Budget.

Note: The steep rise in backlog from 2014/15 to 2017/18 can be attributed to:

- The change in the way that rehabilitation need is identified: up to 2014/15 the average roughness was used in identifying the need, whereas in 2016/17 onwards the 90th percentile roughness values were used as recommended in draft TMH 22 (Committee of Transport Officials, 2013); and
- Deterioration of the network leading to a greater need for rehabilitation and resealing.

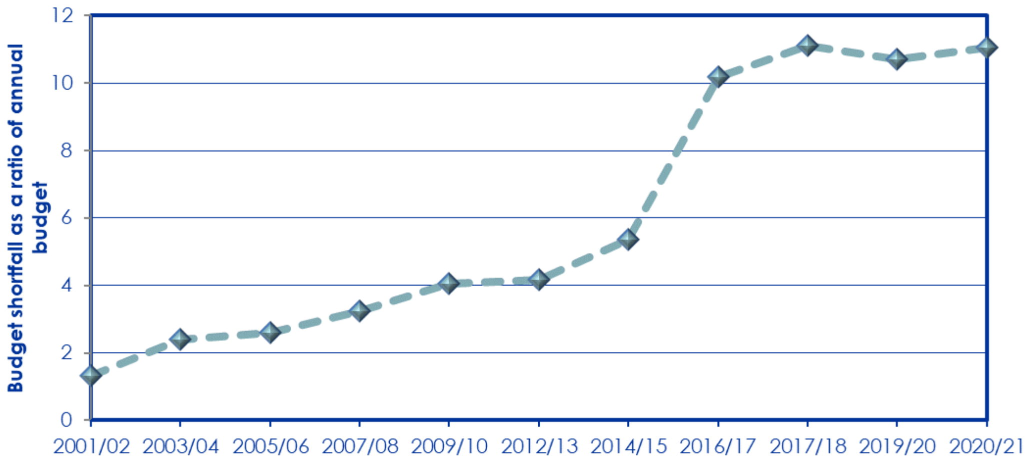


Figure 5-13: The budget shortfall in regravelling, resealing, rehabilitation and the upgrading of unpaved roads to paved roads as a ratio of the 5-year average annual budget

5.1.15 Analysis of funding levels

Table 5-9 provides a description of the funding (budgets) that have been investigated for their impact on future network conditions and costs.

Table 5-9: Funding scenarios investigated

Scenario	Description
Provincial MTEF Budget	The current funding level investigates the consequences of the MTEF Budget allocation for regravelling, resealing, light rehabilitation/rehabilitation/ reconstruction and upgrading to paved standards on the performance of the network. The allocations were calculated from the Rational Portfolio Management Project Management System deliverables and therefore do not include any treatments other than the four referred to here.
Optimised MTEF Budget	The current MTEF funding scenario with optimised fund allocation across the different intervention treatments, i.e. to gain maximum benefit from the available funding level. Using the current MTEF funding level, the fund allocations for regravelling, resealing, light rehabilitation/rehabilitation and upgrading to paved standards are optimised. The allocations were calculated from the RPM deliverables and therefore do not include any treatments other than the four referred to here.
Intervention Budget	A funding level is determined with the objective of maintaining the overall NCN of paved roads at approximately 70% whilst maintaining the proportion of poor to very poor paved roads below 10%. For unpaved roads, the objective is to regravel those roads classified with medium and high LOS and those unpaved roads classified as low and very low LOS with spot regravelling. Compliance with intervention levels is achieved immediately for paved roads and is phased-in over 10 years for unpaved roads.
Technical Needs Budget	This budget reflects the total current demand of the road network. It is a theoretical budget scenario preventing all roads from deteriorating beyond the treatment intervention thresholds. All intervention activities, i.e., preventive maintenance, rehabilitation and upgrading, are adhered to as soon as the need arises, without regard to cost, i.e., an unconstrained budget. The result of this scenario is minimised transport costs and roads that are preserved in an optimal condition. The objectives of this scenario are as follows: • The backlog of paved roads in a poor to very poor condition is removed immediately; • Paved roads are resealed timeously; • Unpaved roads with justifiable economic benefits are upgraded to paved standards immediately; • Unpaved roads with insufficient gravel material are regravelled immediately; and • The road network is maintained in an optimal condition after the backlog has been cleared.

MTEF budget analysis

An objective of this analysis is to determine the consequences of the proposed Medium Term Expenditure Framework budget of the Branch on the road network. The analysis was performed in dTIMS and the results are compared to an "Ideal" scenario. In particular, the lifecycle benefit-cost analysis determines how effective this MTEF budget is in meeting the Branch road preservation needs. Thus, the objective is to answer the questions:

- Is the MTEF funding level sufficient to meet the periodic maintenance, rehabilitation and upgrading needs of the WCG roads?
- Is the allocation of the MTEF funds among periodic maintenance, rehabilitation and upgrading optimal?

For the analysis of the MTEF budget, the combination of the TTC and the AUC objective functions described in paragraph 5.1.13 was used.

The breakdown of the MTEF budget for the Branch for the financial year 2020/21 is shown in Figure 5-14 and Table 5-10 shows the breakdown from 2020/21 to 2024/25. The current funding for 2020/21 is R3 526 million (This budget was calculated using the MTEF funding for all budget categories included in the Vote 10 budget), compared to R3 374 million in 2019/20. The budget for regravelling, resealing, rehabilitation and upgrading to paved standards has not increased significantly. The budget has remained at approximately R3 300 million as stated in the previous RAMP of 2018/19. Figure 5-15 shows the proportions of the 2020/21 MTEF budget analysed in this report.

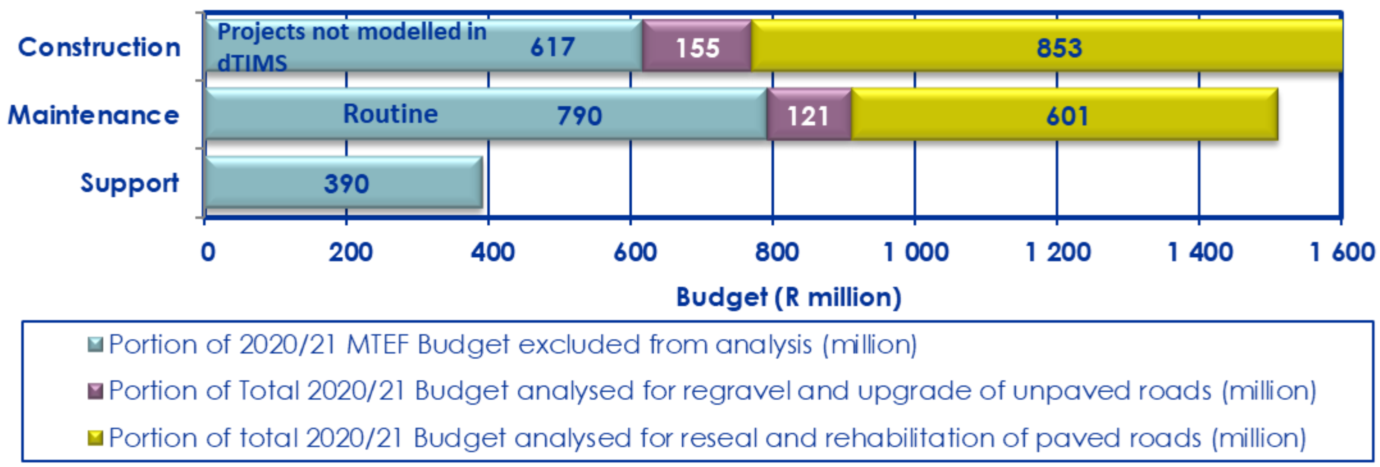


Figure 5-14:Roads branch funding for 2020/21 as at February 2019

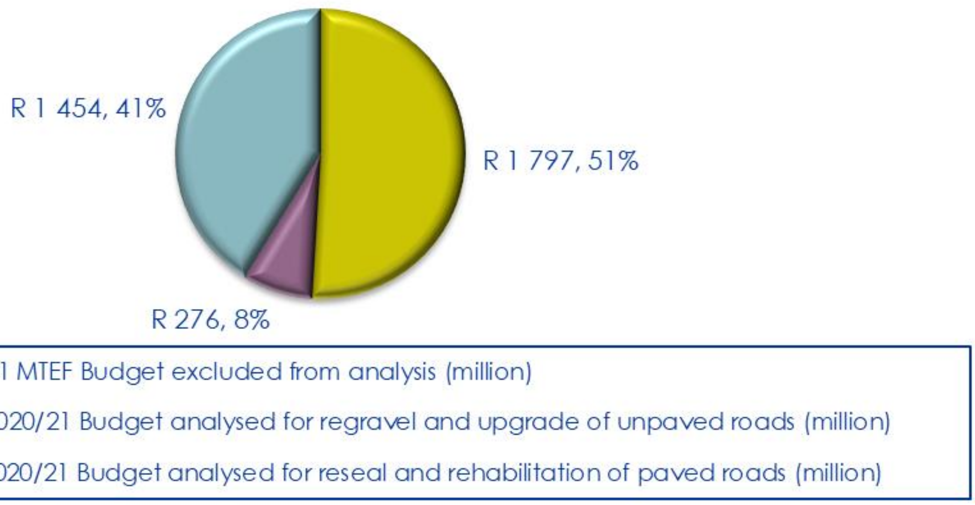


Figure 5-15: Proportions of 2020/21 MTEF budget analysed in this report

Table 5-10: Funding allocation according to the MTEF budget as at February 2019

Budget Item	MTEF Budget				
	2020/21 (x R1000)	2021/22 (x R1000)	2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (x R1000)
Programme support	42 536	44 491	46 220	49 051	51 503
Planning	91 572	96 602	100 434	106 509	111 828
Design	256 117	259 361	261 849	274 888	288 670
Total support	390 225	400 454	408 503	430 448	452 001
Rehabilitation and reconstruction of surfaced roads	852 798	672 296	672 296	672 296	672 296
Gravel road upgrading	155 000	253 000	253 000	253 000	253 000
Paved road upgrading	521 546	776 220	776 220	776 220	776 220
Access, new facilities and safety	21 000	200 500	419 000	789 000	382 000
Transfers: Cities and municipalities	74 000	66 000	11 000	19 000	20 000
Total Construction	1624 344	1968 016	2131 516	2509 516	2103 516
Reseal	601 340	438 720	438 720	438 720	438 720
Regravel	120 560	117 710	117 710	117 710	117 710
Routine maintenance	538 485	565 372	594 195	623 904	655 096
Other maintenance items (Bridges, transfers and agency fees)	251 491	258 656	259 383	321 814	340 359
Total Maintenance	1511 876	1380 458	1410 008	1502 148	1551 885
Total of the Branch	3 526 445	3 748 928	3 950 027	4 442 112	4 107 402
Annual increase		4,4%	3,6%	24,4%	1,5%
Total budget optimised	1 729 698	1 481 726	1 481 726	1 481 726	1 481 726
Optimised budget as proportion of total budget	49%	40%	38%	33%	36%

For the next five years, the portion of the annual MTEF budget allocated for periodic maintenance, light rehabilitation/rehabilitation and upgrading to paved roads ranges between 33% and 49% of the total budget of the Roads Network Management Branch. It is this portion of the MTEF budget that is optimised in the analysis to find the optimal allocation for periodic maintenance, rehabilitation and the upgrading of unpaved roads to paved standards.

The current and historic MTEF Budget proportions are shown in Figure 5-16. The portion of allocated funds for maintenance, rehabilitation and upgrading remains at approximately half of the funds.

The maintenance activities investigated are those with identifiable intervention levels and reset values associated with the pavement performance prediction models (Appendix I – Calibration factors for modelling performance).

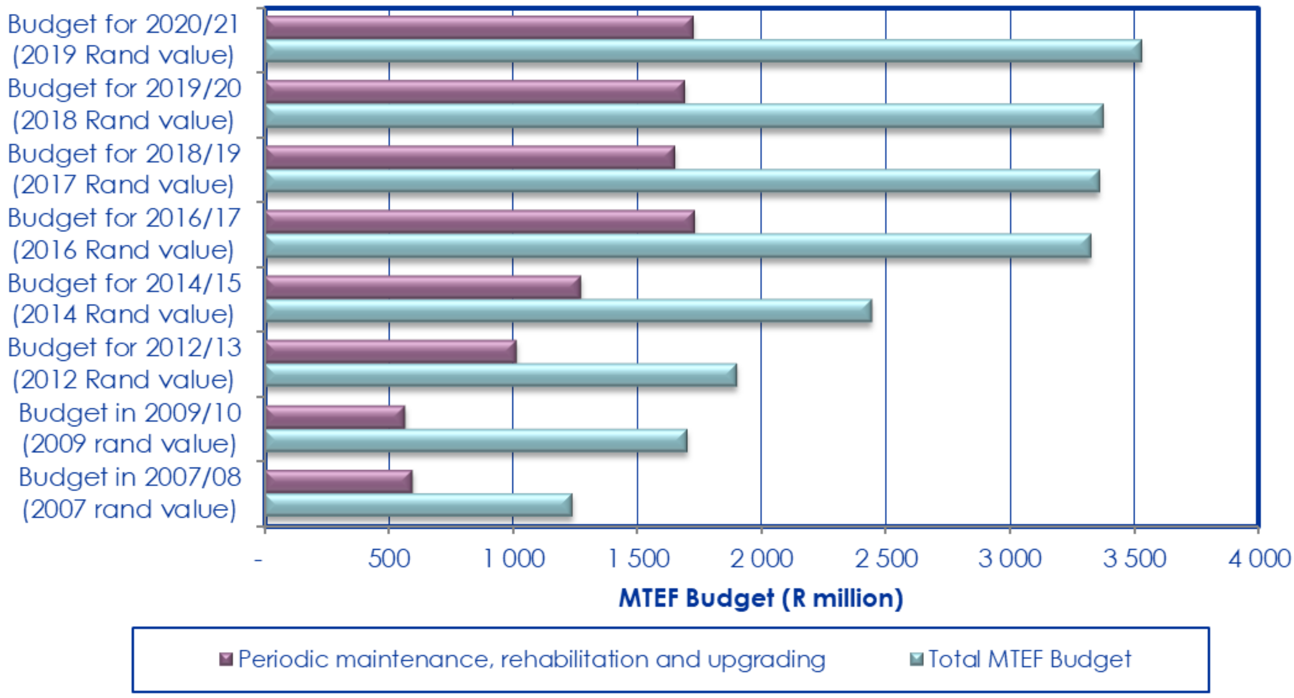


Figure 5-16: Current and historic MTEF budgets and the proportions that are optimised

The fund allocation presented in Figure 5-17 and Table 5-10 is being implemented by the Branch. Major investments for paved roads are planned for the period 2020/21 to 2024/25. Allocation includes the treatment of light rehabilitation that is utilised in constraint economic development based on the budgets of Table 5-10.

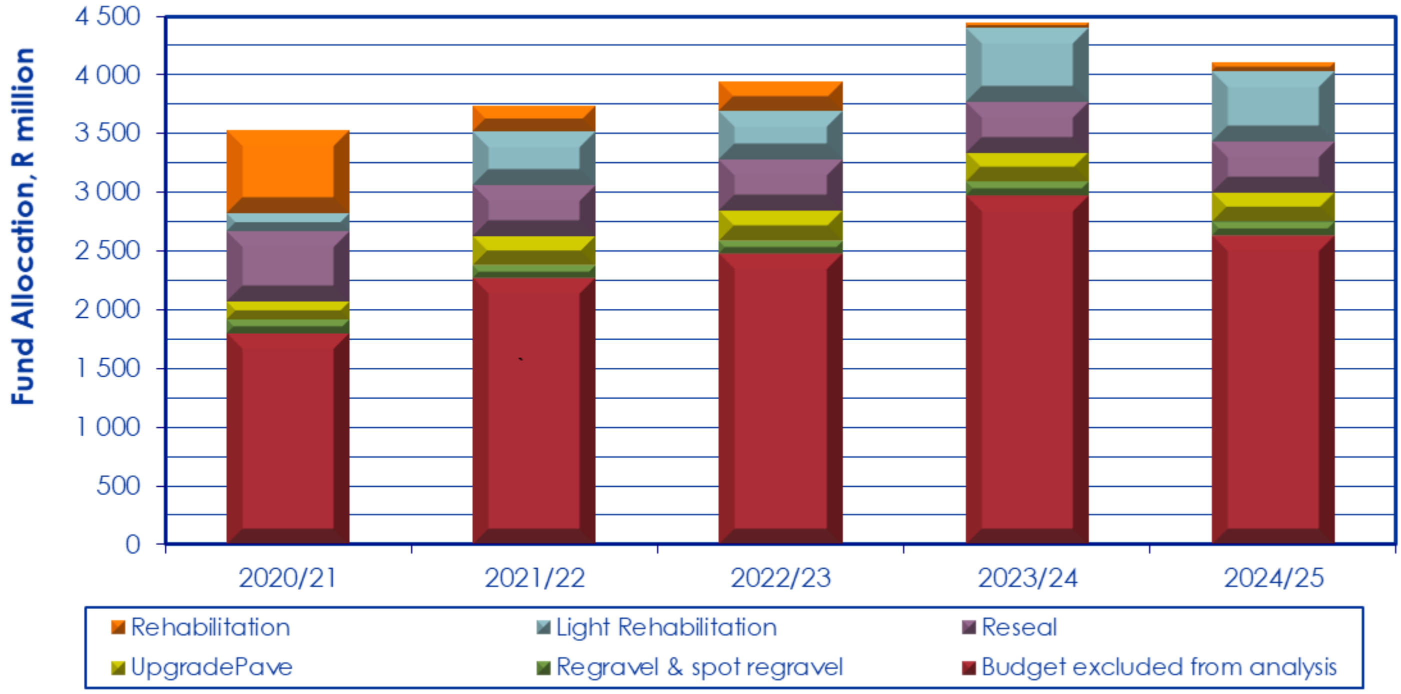


Figure 5-17: The provincial allocation of MTEF budget, analysing the allocation for regraveling, resealing, light rehabilitation, rehabilitation and upgrading to paved standards

Comparison of actual MTEF Budget with Optimised MTEF Budget

Analysis was performed in dTIMS to investigate the consequences of the proposed provincial allocation of the MTEF budget and the results are compared to an "Ideal" scenario (Ideal split of the current MTEF budget).

Table 5-11 shows the average funds allocated to the five categories of the Provincial MTEF Budget, which is compared to the "Optimised MTEF Budget", which optimally assigns funds to the five activities. This re-allocation maximises the benefit, while minimising the loss in asset value for the province and its road users.

Figure 5-18 graphically compares the Provincial MTEF budget allocation to the Optimised MTEF budget allocation according to the results of the optimisation process.

The comparison of the Optimised MTEF Budget versus the Provincial MTEF Budget highlights the focus of the Optimised funding scenarios on paved roads. The Optimised MTEF budget is 97% funding for resealing, light rehabilitation and rehabilitation of paved roads compared to the Provincial MTEF budget of 77%. The optimal split results in the maximum investment return for the current funding level. Both the Optimised MTEF Budget and MTEF budget invests a higher need for lighter rehabilitation than rehabilitation, 10% higher than the previous dTIMS analysis. Paragraph 5.1.16 has full details on the consequences of this maintenance scenario.

Paved roads carry 96% of the vehicle-km driven on the WCG road network and the higher investment in paved roads is clearly due to the number of road users on paved roads.

Funds allocated to lighter rehabilitation will only increase if increased funding is available. The five activities investigated for the Optimised MTEF Budget are discussed below.

Table 5-11: Provincial versus optimised MTEF budget

Budget Item		All amounts in 2019 Rand Value (millions)			
		Provincial		Optimised	
		2020/21	Average 2020/21 to 2024/25	2020/21	Average 2020/21 to 2024/25
Optimised activities	Spot regravelling	121	116	2	28
	Regraveling			12	4
	Resealing	601	471	879	345
	Light Rehabilitation	146	451	107	729
	Rehabilitation	707	257	690	410
	Upgrading to paved standards	155	232	40	13
Totals		**1 729**	**1 528**	**1 730**	**1 529**

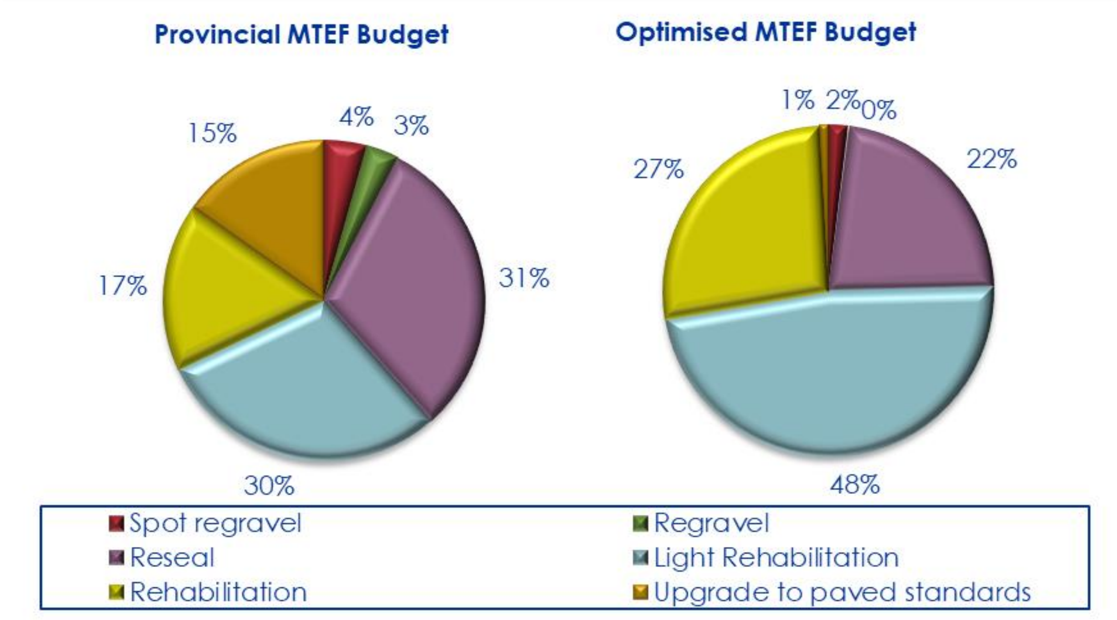


Figure 5-18: Comparison of the provincial MTEF budget versus the optimised MTEF budget, average annual expenditure for the period from 2020/21 to the end of 2024/25

Resealing

Deterioration of the roads caused by normal traffic, excluding overloaded vehicles, cannot be prevented. Should the pavement structure deteriorate beyond the point of effective resealing intervention, the only option is light rehabilitation/rehabilitation of the pavement layer(s). Resealing, in the short to medium term, prevent an explosive growth of expensive light rehabilitation/rehabilitation projects. The benefit in terms of cost savings and network condition yield the largest return if more of the available funding is allocated to resealing. The importance of road maintenance to ensure sustainability of the road network by means of **optimal timing and frequency of preventive maintenance** is emphasised. Picture 5-1 and Picture 5-2 show evidence of how a road in poor condition can deteriorate rapidly within a year due to lack of appropriate periodic maintenance.

Picture 5-1: TR22/1 on 17/6/2006

Picture 5-2: TR22/1 on 12/7/2007 showing development of potholes

The current strategy of the Branch (paragraph 1.4.4) resulted in approximately 32% (2 150 km) of the paved road network being resealed over the last 5 years. This is a little less than required for an estimated average 10 year optimum seal life.

- Since 2012/13, the unit costs for the resealing of paved roads have almost doubled. The average cost per square metre is now R225.
- The optimisation analysis reduces the average allocation of funding for the resealing of paved roads, which shows that the number of reseals over the past years been too little allowing the roads to deteriorate to where only Light Rehabilitation can fix the problems.
- The allocation for reseals could decrease to an average of R126 million per annum over the next 5 years.

Light Rehabilitation

- The provincial fund allocation for light rehabilitation is less than the optimal funding allocation identified by the Optimised MTEF funding scenario.
- The average light rehabilitation investment should increase to approximately R 278 million per annum.

Rehabilitation

- The provincial fund allocation for rehabilitation is less than the optimal funding allocation identified by the Optimised MTEF funding scenario
- The average rehabilitation investment should increase to approximately R 153 million per annum.

Regravelling and upgrading of unpaved roads

The reallocation of investment in the Optimised MTEF Budget directly affected the available funding for the unpaved road network and the fund allocation for all unpaved roads subsequently reduced.

- The provincial fund allocation for regravel and spot regravel is more than the optimal funding allocation identified by the Optimised MTEF funding scenario
- Approximately 138 km of unpaved roads are upgraded in the first 5 years with the MTEF budget, 42 km of these roads are also upgraded in the optimised analysis. These roads all have economic reasons for upgrade to paved standards.

Comparison of Provincial MTEF budget and Optimised MTEF budget over 10 years

The Provincial and Optimised MTEF Budgets for the next ten years are compared in Figure 5-19. Theoretically, according to optimisation analysis of the MTEF Budget, the network will gain maximum benefit if the funding for paved roads is increased on average by R274 million per annum. This proposed increase in expenditure on rehabilitation (including light rehabilitation) will only have a small effect on the overall condition of the paved road network—see paragraph 5.1.16.

Overall, the road network condition is very unlikely to improve under the current MTEF Budget and unit rates, but the optimised allocation of funding assures the best possible preservation of the roads.

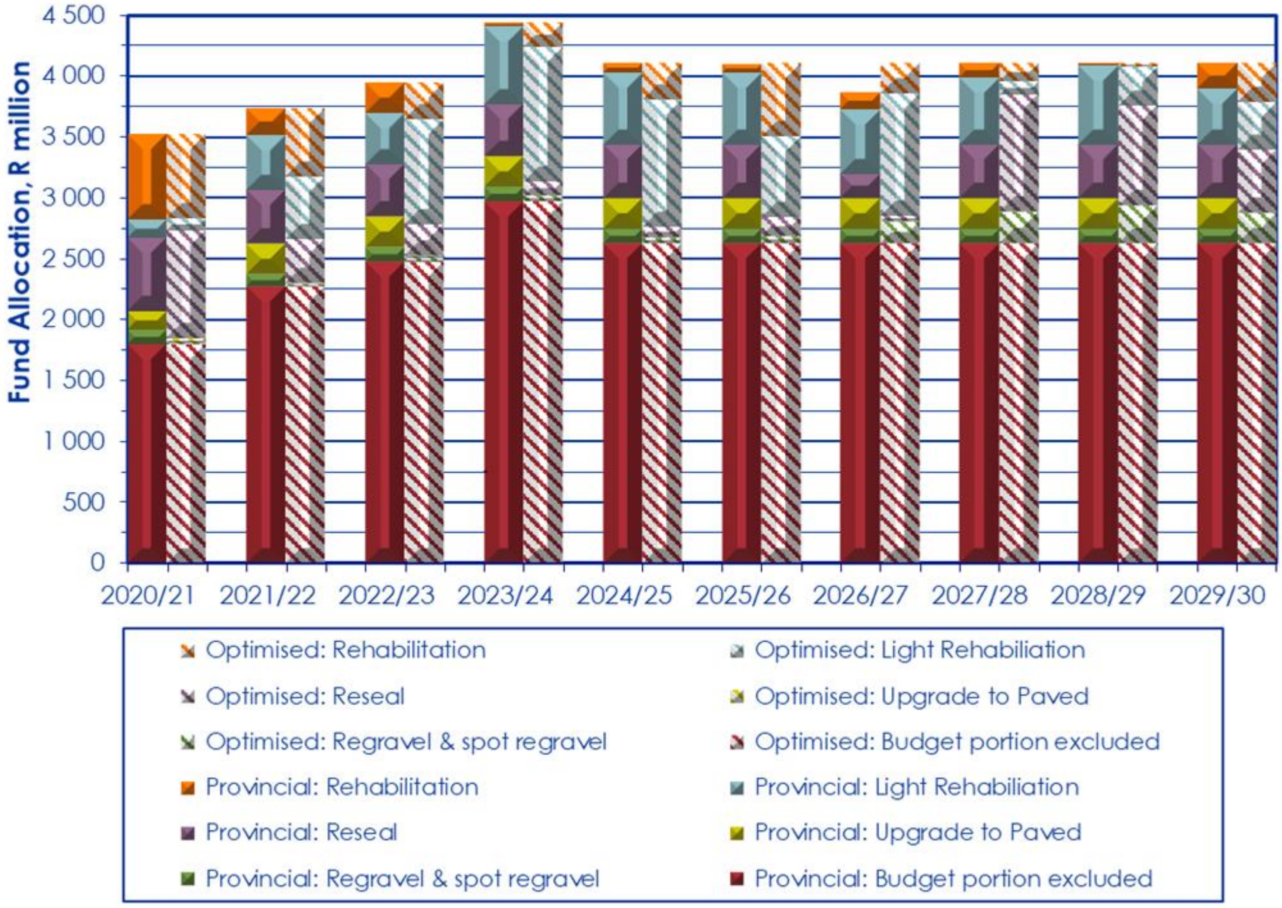


Figure 5-19: Provincial and optimised allocations of the MTEF funds over the next 10 years

MTEF Budget compared to the Intervention Budget

The Intervention Budget analysis estimates a realistic funding level to maintain the desired levels of service of the road network. It includes roads requiring:

- Upgrading to paved standards;
- Regravelling;
- Resealing;
- Light Rehabilitation; and
- Rehabilitation due to pavement deterioration.

The Intervention Budget requires funding of approximately R3 700 million per annum over the next five years to maintain both the paved and unpaved road networks at their levels of service. The Intervention Budget will improve the performance of the road network. The extent of the improved performance levels is shown in paragraphs 5.1.16 and 5.1.17.

The Provincial MTEF Budget Allocation is compared to the Intervention Budget to determine the shortfall. It calculates the extra funds that are required for regravelling, spot regravelling, resealing, light rehabilitation, rehabilitation/ reconstruction and upgrading to paved standards to ensure the majority of roads function above the intervention levels. Table 5-12 shows the results of the analysis.

Table 5-12: Intervention budget for 10 years

Year	All budget amounts in 2019 Rand Value (millions)						
	Regravelling	Upgrading to Paved	Resealing	Light Rehabilitation	Rehabilitation	Other[1]	Total
2020/21	732	768	970	181	1 049	1 797	5 497
2021/22	787	713	284	974	943	2 267	5 967
2022/23	988	512	224	1 282	694	2 468	6 168
2023/24	951	549	192	1 325	684	2 960	6 660
2024/25	888	612	141	1 292	767	2 626	6 326
2025/26	704	796	66	1 415	719	2 626	6 326
2026/27	1 078	422	9	1 251	939	2 626	6 326
2027/28	788	712	1 204	567	428	2 626	6 326
2028/29	700	800	1 240	553	407	2 626	6 326
2029/30	773	727	998	383	820	2 626	6 325
5 Year Average 2020/21 to 2024/25	**869**	**631**	**362**	**1 011**	**827**	**2 424**	**6 124**
Provincial MTEF Budget							
Average for 2020/21 to 2024/25	116	232	471	451	257	2 424	3 951
Annual average shortfall	753	399	-109	559	570	-	2 172
Current shortfall measured against annualised need of Intervention Budget	**121**	**155**	**601**	**146**	**707**	**-**	**3 526**

Note 1: The budget amount "Other" refers to all expenditure that is not optimised in dTIMS

Compared to the Intervention Budget, the MTEF budget is insufficient. The performance of the majority of roads cannot be maintained without continued deteriorating performance levels, as discussed in paragraphs 5.1.16 and 5.1.17. The outcomes from the Intervention Budget (all categories of work) are as follows:

- An annualised expenditure of approximately R6 124 million is required over the next five years for the network. Paved roads will then function within the roughness and condition threshold values given in Table 5-6, and unpaved roads will function according to the levels of service in Table 3-3.
- The required funding level of the Intervention Budget is 242% more than the MTEF funding level for preventive maintenance such as resealing, spot regravelling and regravelling and for light rehabilitation, rehabilitation and upgrades to paved standards, or approximately R2 172 million per annum over the next five years.

The objectives of each of the categories of preservation and upgrading are dealt with below:

Rehabilitation, light rehabilitation and resealing

In order to maintain the paved road network to appropriate condition levels in the long term, an average expenditure of approximately R2 200 million is required for resealing, light rehabilitation and rehabilitation over the next 5 years.

Regravel

A very high, annualised need was determined, being in excess of 2 203 km for spot regravelling and more than 135 km for regravelling of the wearing surfaces. This is directly related to the 36% of unpaved roads operating in a poor to very poor condition. For unpaved roads classified as medium and high LOS, the Intervention Budget in this analysis has the objective of gradually regravelling roads with inadequate gravel thicknesses. For unpaved roads classified as low and very low LOS, the maintenance intervention of spot regravelling is used on roads with inadequate gravel thickness.

An average annualised expenditure of approximately R869 million is required for regravelling and spot regravelling over the next 5 years.

Upgrade unpaved roads to paved standards

The proposed annualised funding level of the Intervention Budget for upgrades is approximately R399 million per annum less than the MTEF Budget. In the analysis of the Intervention Budget, approximately 210 km of unpaved roads were selected to be upgraded to paved standards in the first 3 years. These all carry more than 400 vehicles per day.

An average of approximately R631 million per annum is required for upgrading to paved standards over the next five years.

Technical Needs Budget

The funding required to meet the criteria of the **Technical Needs Budget** was determined using the dTIMS optimisation software (Table 5-13).

Table 5-13: Technical needs budget for 10 years and the MTEF Budget shortfall

Technical Needs Budget (R million)					
Year	**Regravelling**	**Upgrade to paved**	**Reseal**	**Rehabilitation**	**Total**
2020/21	3 034	2 944	3 155	16 698	25 831
2021/22	306	334	709	1 911	3 259
2022/23	534	516	507	1 658	3 214
2023/24	1 277	311	451	1 766	3 805
2024/25	1 105	542	323	886	2 857
2025/26	457	608	73	147	1 284
2026/27	1 625	796	0	0	2 421
2027/28	163	710	7 645	2	8 519
2028/29	957	281	1 690	140	3 067
2029/30	1 205	624	1 104	7	2 940
Provincial MTEF Budget Allocation for 2020/21	121	155	601	853	1 729
2018/19 MTEF theoretical budget backlog1	2 913	2 789	2 554	15 845	24 102

Note 1:
The theoretical budget backlog is determined by comparing the 2020/21 Provincial MTEF fund allocation to the 2020/21 Technical Needs Budget

The Technical Needs Budget is a **theoretical funding level** that is used to determine the investment required to remove the backlog of roads requiring rehabilitation, periodic maintenance and upgrading to paved standards, as follows:

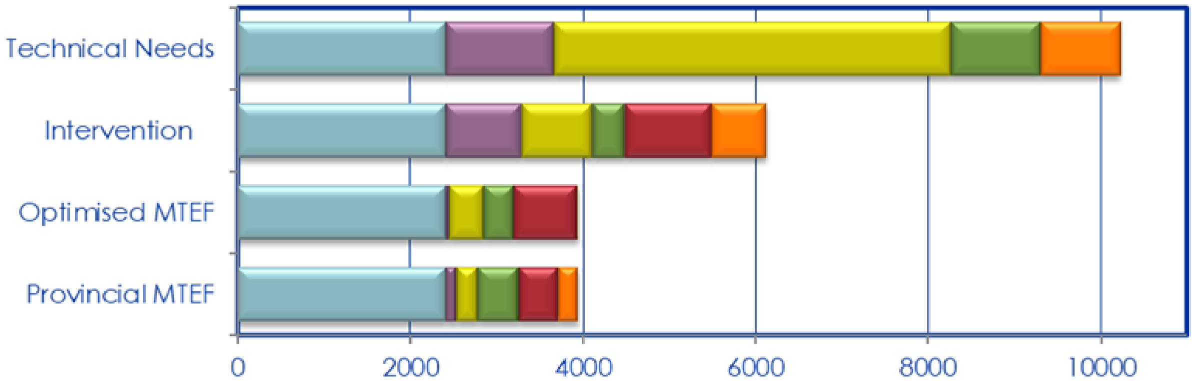
- All unpaved roads are upgraded to paved standards where it is economical to do so. The upgrading demand is approximately R2,9 billion and affects approximately 287 km of unpaved roads.
- All medium and high LOS unpaved roads are maintained with a minimum gravel thickness of 50 mm. Low and very low LOS roads are maintained by means of spot regravelling.
- Cost-effective preventive maintenance on paved roads (resealing) is applied as soon as the need arises. Roads are not permitted to deteriorate to a state where rehabilitation is necessary.
- Light rehabilitation is not a function of the Technical Need Budget as this is not a constraint circumstance.

This immediate (2020/21) investment need was calculated at R26,5 billion to eliminate the backlog, excluding the items that were not optimised, e.g., safety improvements, routine maintenance, new infrastructure, overheads, etc. For the 4-year period thereafter, 2021/22 to 2024/25, an average annual funding of approximately R3 284 million is required to maintain both paved and unpaved roads at these optimum performance levels. This funding level would result in the optimum benefit.

Comparison of the four budgets

The four budgets are compared in Figure 5-20.

- The **Intervention Budget** is approximately 242% more than the total MTEF Budget and the **Technical Needs Budget** is nearly five times the total MTEF Budget.



	Provincial MTEF	Optimised MTEF	Intervention	Technical Needs
Budget excluded from optimisation analysis	2 424	2 424	2 424	2 424
Regravel & spot regravel	116	32	869	1 251
Rehabilitation	257	410	827	4 584
Reseal	471	345	362	1 029
Light Rehabilitation	451	729	1 011	-
Upgrade to Paved standard	232	13	631	929

Average annualised fund allocation for 2020/21 to 2024/25 (R Million)

Note 1:
Based on the current MTEF budget statement, an averaged additional amount of R2 433 million will be required annually for support, access, new facilities, transfers, surfaced road upgrading, routine maintenance and maintenance of bridges.

Figure 5-20: Distribution of funding for various budgets based on a 5-year average

The cash flows in Figure 5-21 show the funding demand of the four budget scenarios over a 5-year period for regravelling, resealing, light rehabilitation/rehabilitation and upgrading to paved standards.

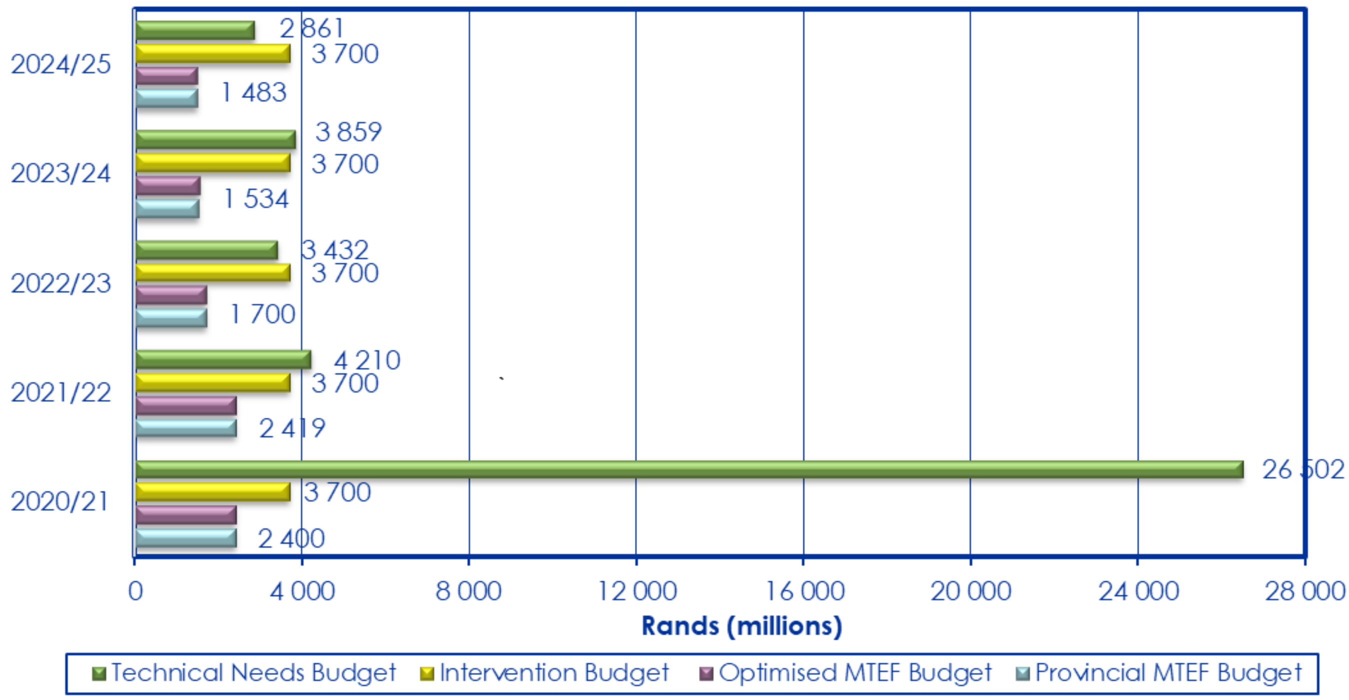
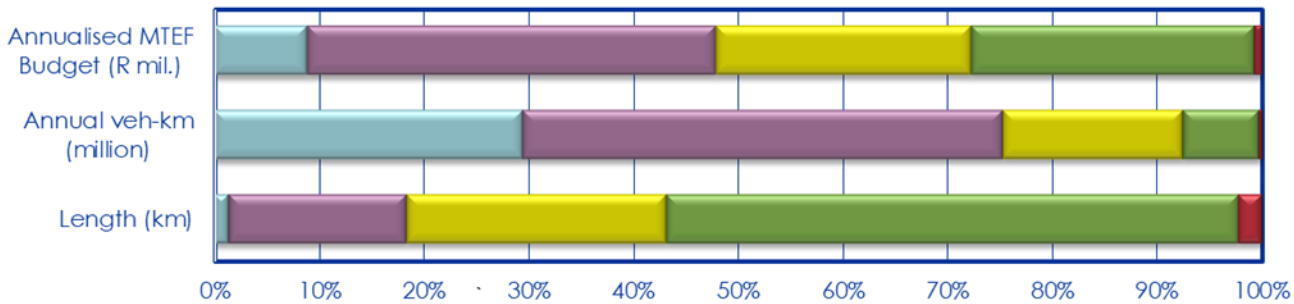


Figure 5-21: Predicted expenditure for regravelling, resealing, light rehabilitation, rehabilitation and upgrading of unpaved roads to paved standards for the four budgets

Optimised fund allocation according to RCAM classification

Figure 5-22 presents the optimised fund allocation of the MTEF budget per RCAM classification for the road network. The optimisation analysis allocated the majority of funding towards the higher RCAM class roads, thus affecting the majority of traffic and promoting mobility in those parts of the network where there is economic development and commerce.



	Length (km)	Annual veh-km (million)	Annualised MTEF Budget (R mil.)
RCAM 1	236	2 194	107
RCAM 2	2 900	3 421	471
RCAM 3	4 205	1 289	294
RCAM 4	9 285	541	325
RCAM 5	370	21	9

Figure 5-22: Road network according to RCAM classification versus the MTEF budget allocation

5.1.16 Consequences of budgets on paved roads

The consequences likely to follow from each of the four budgets are summarised under this section to highlight the predicted performance of the paved road network.

Level of service

Figure 5-23 shows the predicted overall network condition of paved roads in terms of the NCN. For both the Provincial MTEF Budget and the Optimised MTEF Budget, it is expected that the network condition will decline considerably over the next ten years. Furthermore, the NCN benchmark of 70%, as described in paragraph 4.9.1, will not be maintained under the current MTEF budget. The MTEF Budget would need to be increased by 242% to ensure paved roads perform at the NCN benchmark of 70%, at current condition over the 10 year analysis period. The Technical Needs Budget fixes the immediate need on all paved.

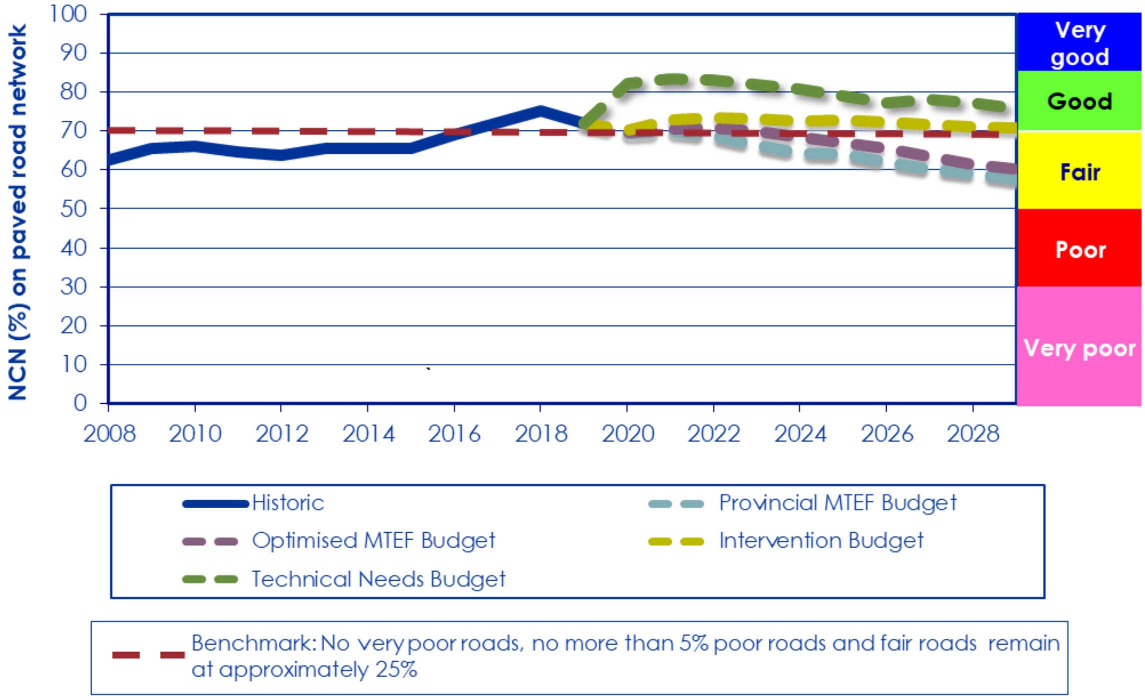


Figure 5-23: Average network condition of paved roads

Currently 44% of paved roads do not meet the minimum intervention levels as detailed in Table 5-6. Figure 5-24 presents the predicted proportion of paved roads that will deteriorate beyond the intervention levels over the next 10 years.

For the MTEF Budget it is predicted that:

- The length of paved roads operating below the intervention levels will increase from 44% to more than 80% over the next 10 years.

The proportion of unpaved roads operating above the intervention levels will increase with the implementation of the regravel programme. This regravel programme assumes spot regravelling is done on unpaved roads classified non-economical and regravelling will be confined to selected routes. The gravel thickness on most unpaved roads will still remain below 50 mm.

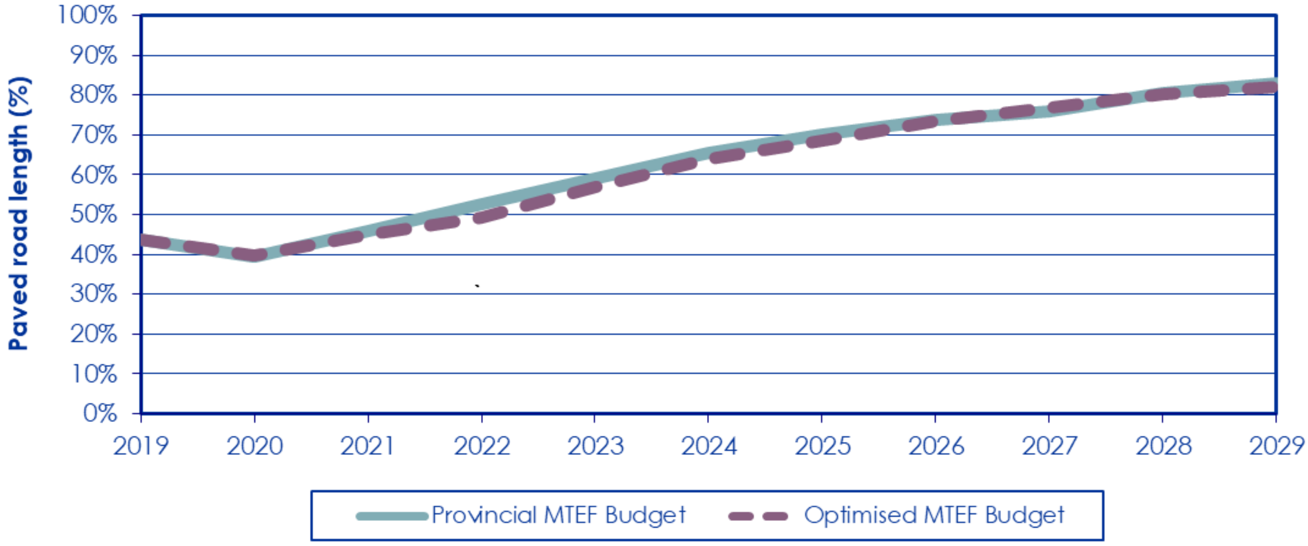


Figure 5-24: Percentage length of the paved road network not meeting the minimum intervention levels

Proportion of paved roads in a poor or very poor condition

Figure 5-25 shows the expected increase in the backlog of poor and very poor roads for the four budgets. At current MTEF funding levels, it is expected that the percentage of paved roads in a poor or very poor condition will increase to more than 20% in the next 10 years.

The MTEF Optimised Budget will reduce the rate of decline slightly. However, the paved roads in the poor or very poor categories will remain just above 20% of the network. The proportion of poor and very poor roads remains below 10% of the length of the paved network for the Intervention Budget.

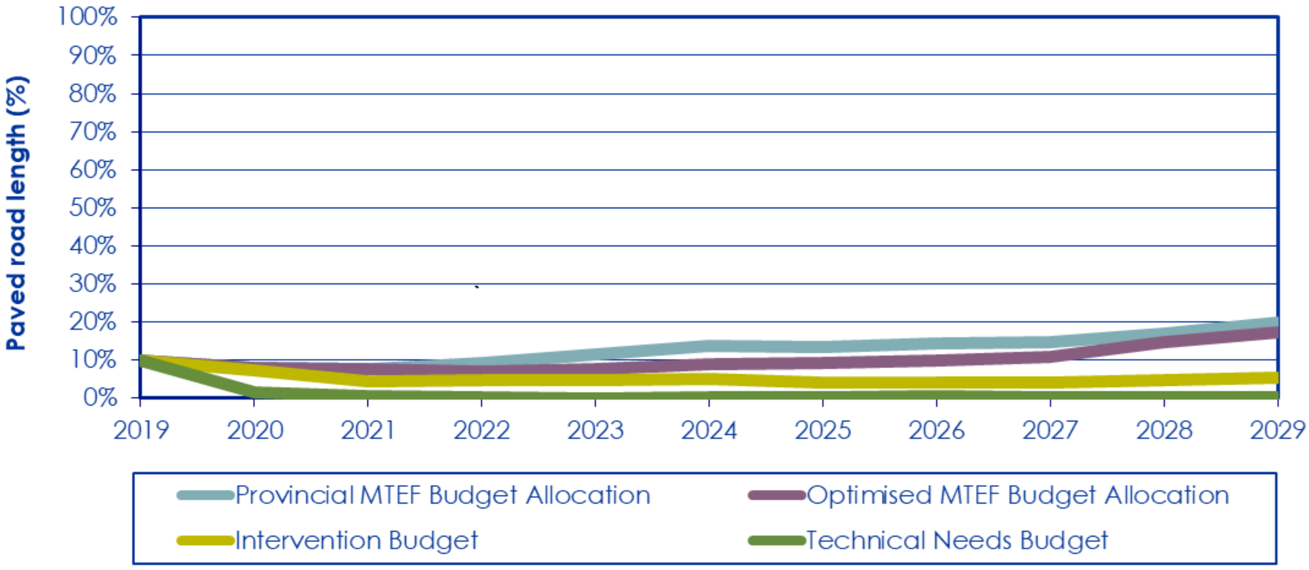


Figure 5-25: Percentage length of paved roads in poor and very poor condition

Change in asset value of paved roads

Figure 5-26 shows changes in asset value for all budgets. The current MTEF budget cannot prevent a long-term decrease in asset value. The current asset value, calculated as the depreciated replacement cost of the network, is approximately R134 billion (Table 5-15).

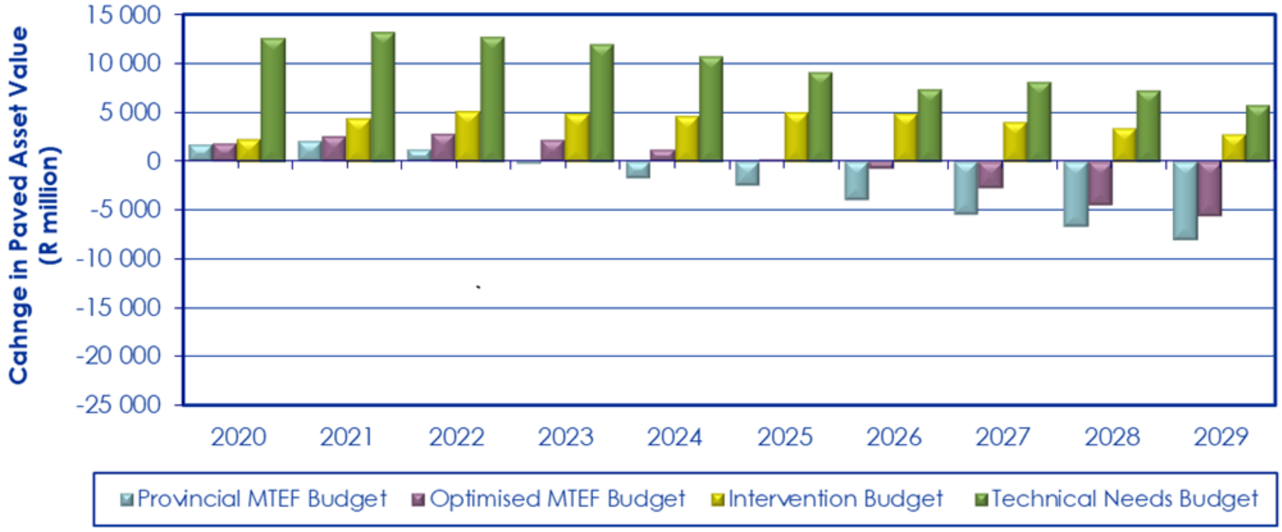


Figure 5-26: Change in asset value of paved roads compared to 2019 values

Excess vehicle operating costs on paved roads

Excess user cost (EUC) is an unnecessary expense for the road user and an inevitable outcome of substandard riding quality of the roads in the network. An IRI of 3,1 was used as the upper threshold for paved roads with a good riding quality. These costs are compared to the Technical Needs Budget analysis and the results are summarised in Table 5-14.

Table 5-14: Predicted EUC on paved roads, over and above the minimum EUC achievable by the technical needs budget

EUC	Provincial MTEF Budget	Optimised MTEF Budget	Intervention Budget
Additional[1] cumulative EUC after 5 year (R million)	R 282	R 64	R 38
Average EUC for next 5 years (R million)	R 90	R 46	R 41
Additional[1] length of road exceeding IRI 3,1 during the 5 year period	2 511 km	2 060 km	1 333 km

Note 1:
Additional in comparison to the optimum achievable performance according to the Technical Needs Scenario.

The top graph in Figure 5-27 shows the additional EUC for the funding scenarios and the bottom graph shows the additional length of paved roads operating with these excess costs to the road users.

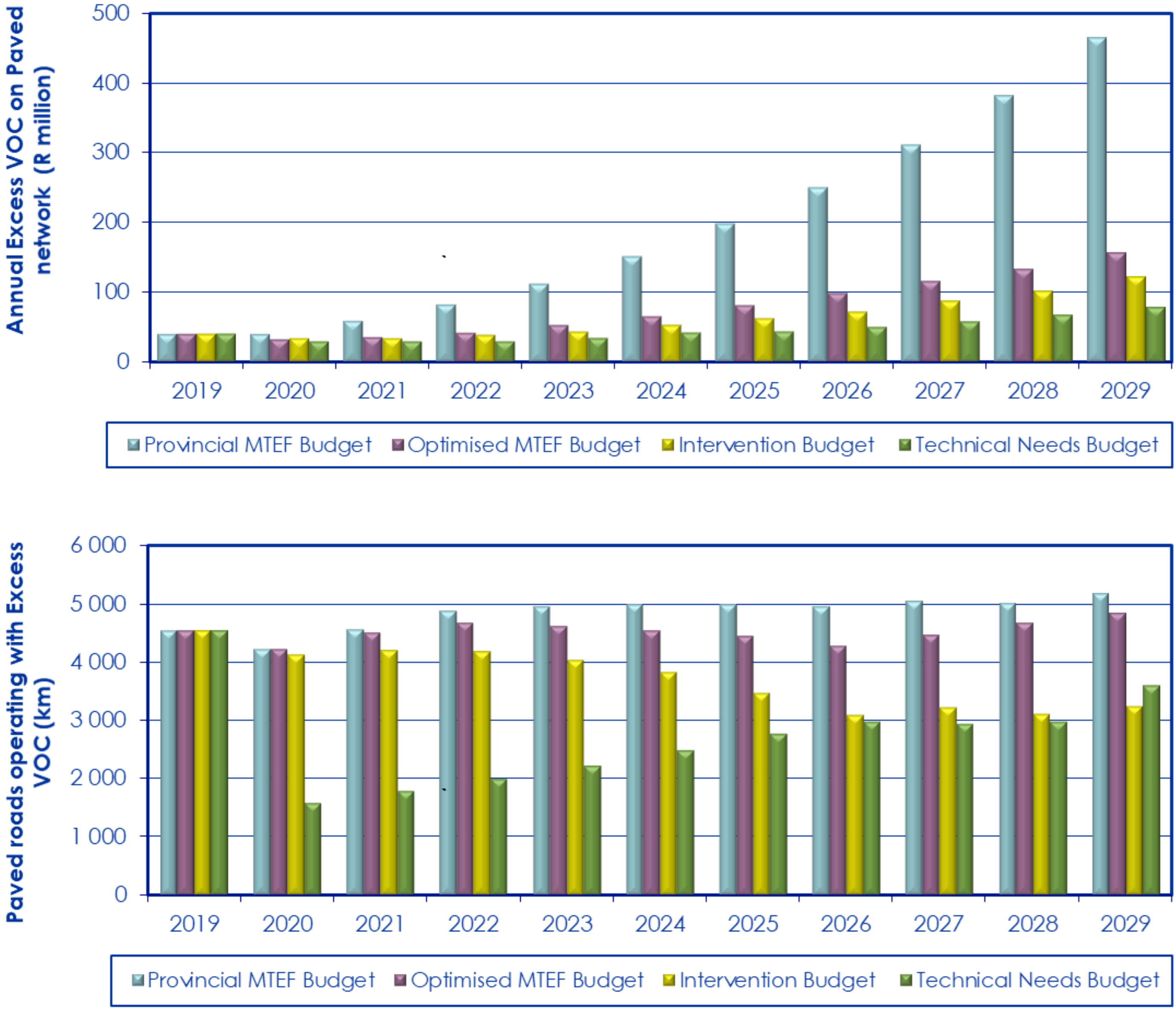


Figure 5-27: Total excess vehicle operating costs in terms of (a) annual cost and (b) km

5.1.17 Consequences of different funding scenarios on unpaved roads

The results of the different budgets analysed are summarised in this section to highlight the predicted performance of the maintained unpaved road network for each of the funding scenarios.

Average gravel thickness

The predicted network gravel thickness of maintained unpaved roads is shown in Figure 5-28. Effective blading requires a minimum thickness of gravel wearing course of at least 50 mm, depending on the particle size distribution of the gravel.

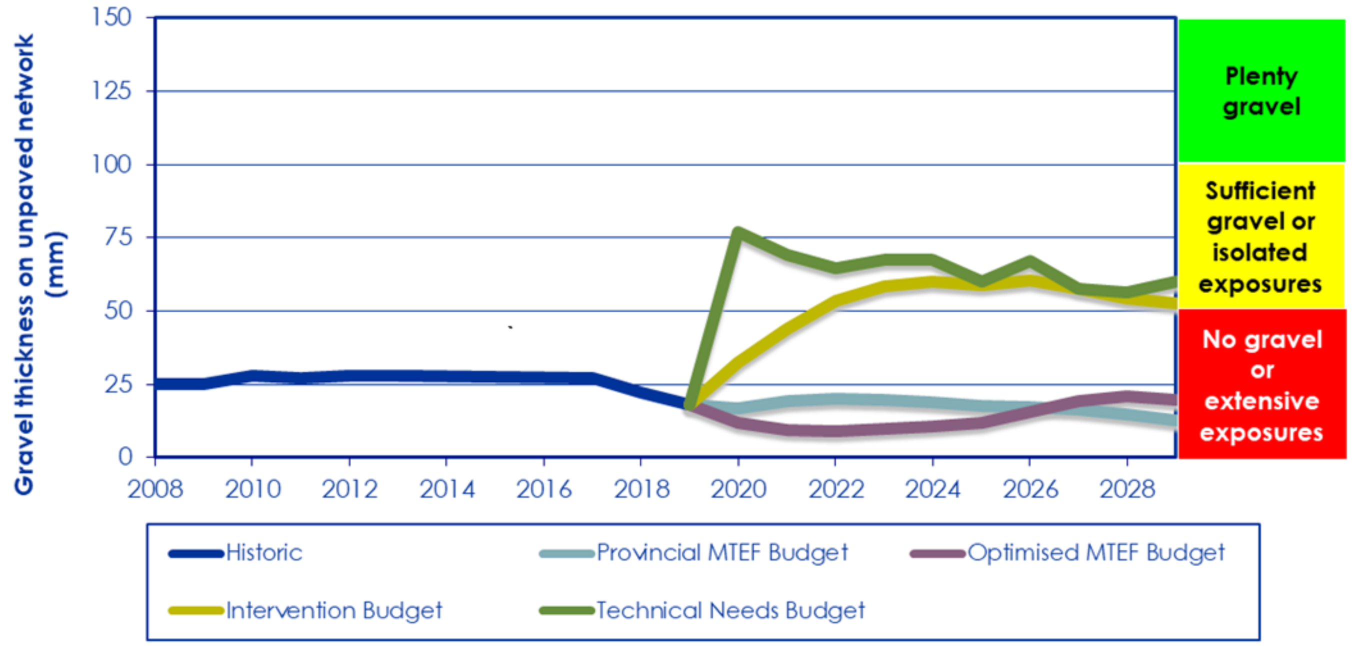


Figure 5-28: Average gravel thickness of maintained unpaved roads

The Provincial MTEF budget for regravelling is an average of R123 million over the next 5 years.

- MTEF funds allocated to regravelling are insufficient to reach this minimum target thickness of 60 mm, although gravel thickness is expected to increase slightly over the next 10 years.
- The outcome of the optimisation analysis indicates an average funding requirement of approximately R32 million per annum over the next 5 years, after which it increases to approximately R207 million per annum over the following 5 years. This funding level, however, allows the average gravel thickness to decrease even further over the next 10 years.
- The Intervention Budget improves the overall thickness of gravel wearing course and the driving conditions experienced by road users. The investment requirement is an average annual amount of R790 million for the next 5 years and increasing to R808 million towards the last 5 years of the analysis for both regravelling and spot regravelling.
- The Technical Needs Budget (Table 5-13) maintains the unpaved roads at optimum performance levels, where all unpaved roads without sufficient gravel material in the medium and high LOS category are regravelled during the first analysis year. Thereafter, all roads are either regravelled or maintained by spot regravelling as required. The immediate funding need for regravel is R2,6 billion and approximately R433 million for spot regravelling, thereafter an average R367 million is required annually to meet the minimum intervention levels.

Figure 5-36 presents the predicted proportions of unpaved roads that will deteriorate beyond the intervention levels. All roads with less than 50 mm gravel wearing course material are included, as well as roads that carry traffic in excess of 400 vehicles per day. Even though the overall condition of the unpaved road network is expected to improve, the demands of the unpaved road network for regravelling still significantly exceed the MTEF funding levels.

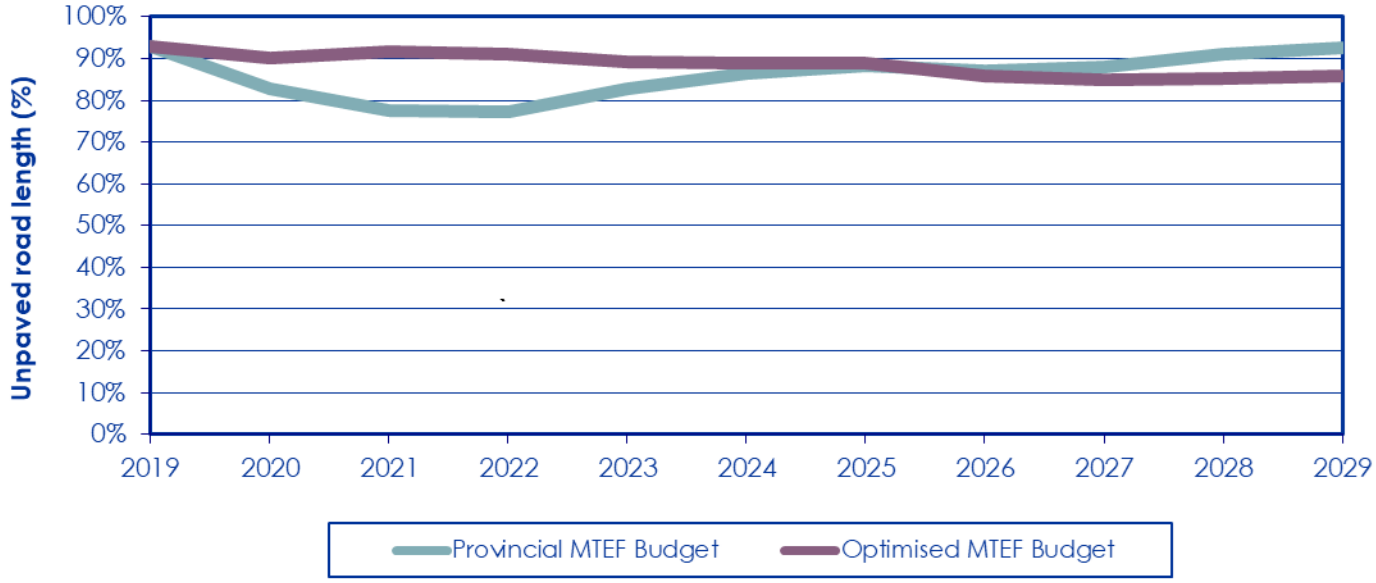


Figure 5-29: Length of the unpaved road network not meeting the minimum intervention levels

Proportion of unpaved roads with no gravel

Figure 5-30 shows the proportion of the unpaved network without any gravel. According to the Intervention Budget, an annual amount of approximately R869 million is needed to maintain unpaved roads at appropriate levels over the next 10 years. The Technical Needs Budget immediately eliminates all roads with no gravel material.

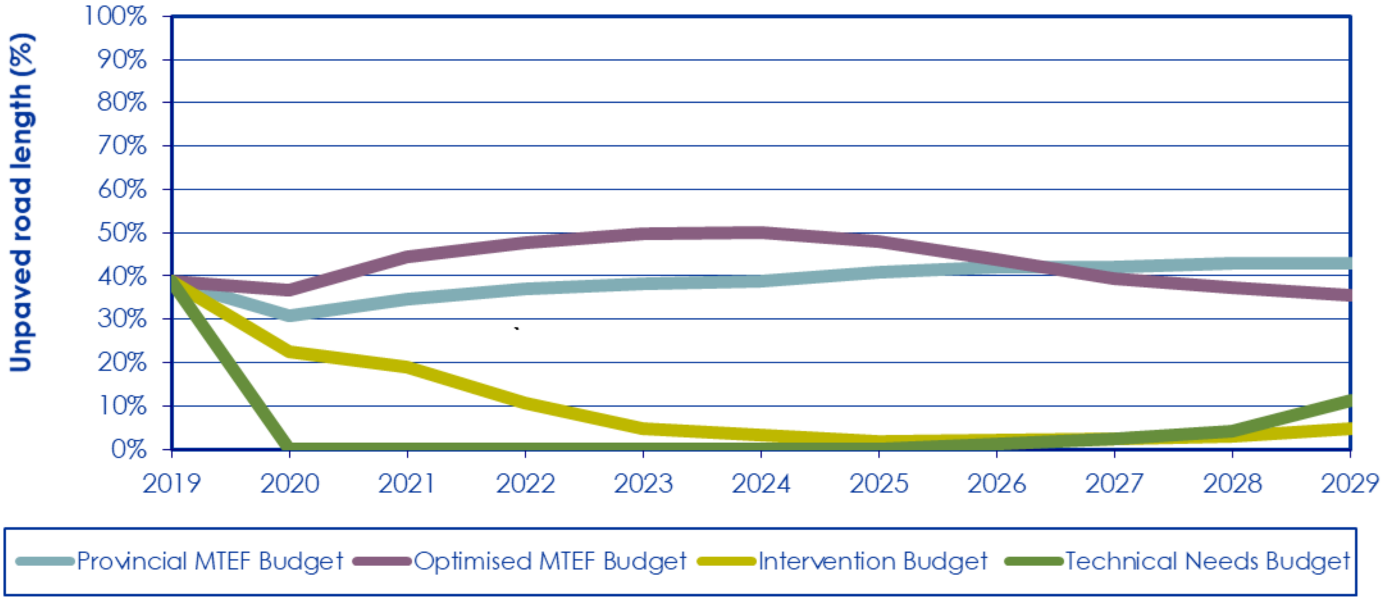


Figure 5-30: Proportion of unpaved roads without gravel, excluding earth roads

Passability of unpaved roads with no gravel

According to draft TRH 20 (Committee of State Road Authorities, 1990), passability is a function of the shear strength of the top layer of the wearing course. With insufficient quantities of coarse gravel in the gravel layer and inadequate subgrade shear strength, passability problems will occur. It is assumed that an average minimum gravel thickness of 50 mm will ensure passability and assist with the maintenance of unpaved roads.

As data on subgrade strength is available from the GRMS, it is envisaged that the strength of the subgrades will be incorporated in a future analysis in order to more accurately determine passability problems.

For this analysis, roads with less than 150 AADT, currently 62% (more than 6 100 km), as well as earth roads, were not included as these roads are not maintained with regravelling. Despite a lack of gravel on these roads, many operate with acceptable passability.

Figure 5-31 shows the predicted proportion of unpaved roads with possible passability problems. For both the Provincial MTEF Budget and the Optimised MTEF Budget it can be assumed the proportion of roads with possible impassability problems would not change significantly.

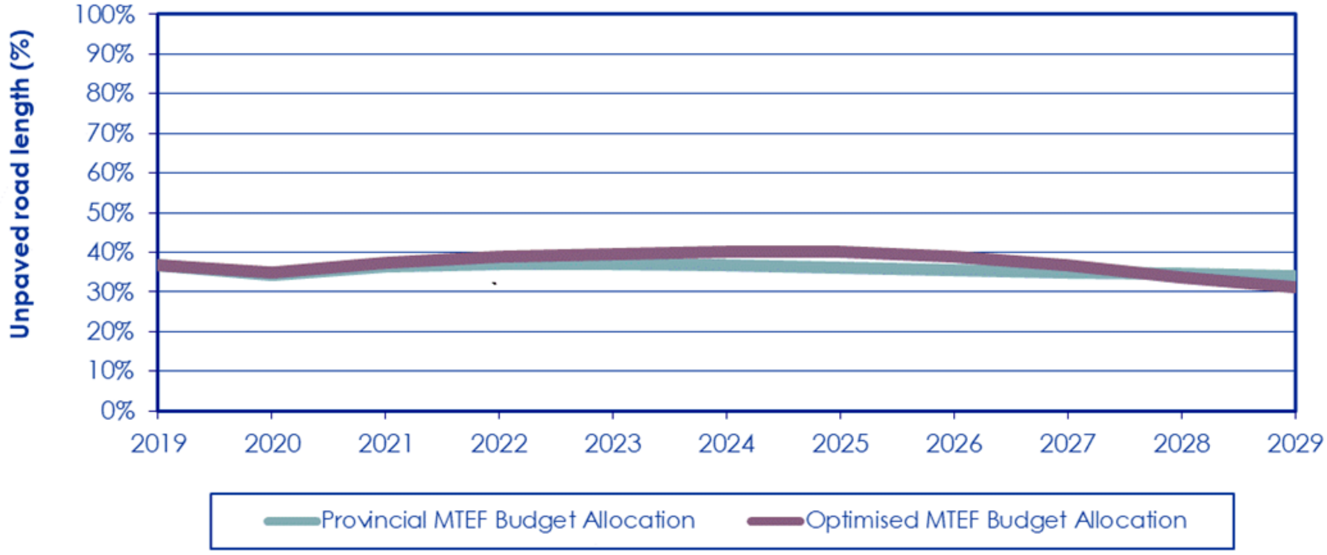


Figure 5-31: Predicted proportion of maintained unpaved roads with possible passibility problems where gravel thickness is <50 mm

Change in asset value of unpaved roads

The Intervention and Technical Needs Budget will substantially increase the asset value of the unpaved network (Figure 5-32). The Provincial MTEF Budget replaces gravel material and applies spot regravelling to a value of R123 million per annum. This level of funding has a positive influence on the asset value levels.

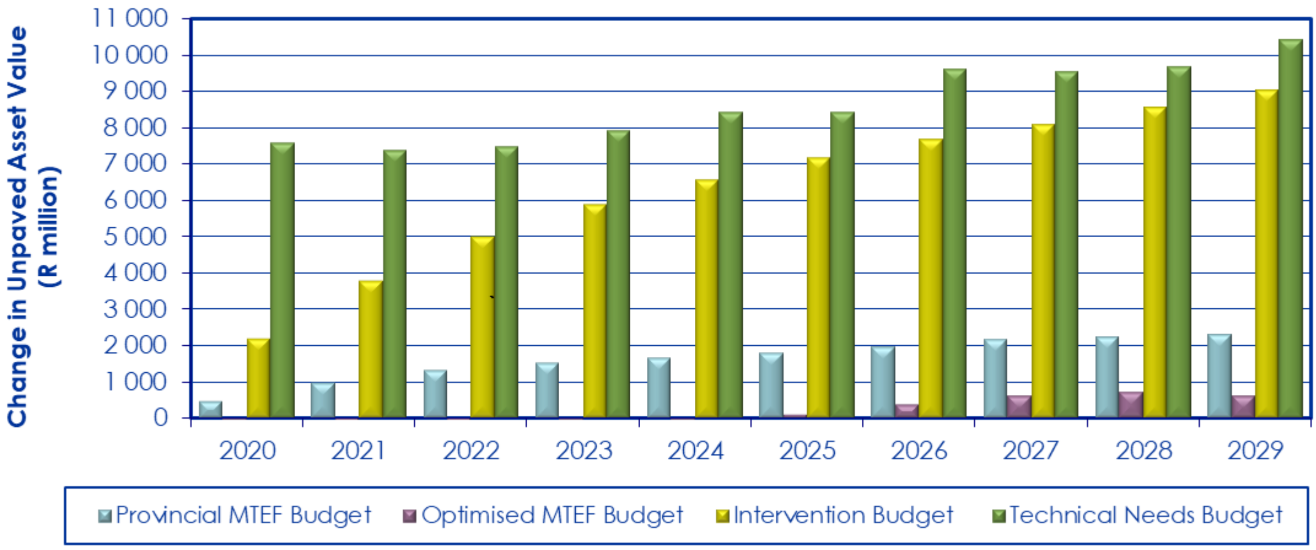


Figure 5-32: Change in asset value of maintained unpaved roads compared to 2019 values

5.1.18 Consequences of different funding scenarios on the asset value of the road network

The theoretical asset values, estimated as the current replacement cost for each of the various budgets analysed using dTIMS in 2018, are shown in Table 5-15.

Limitation: The asset values do not include the drainage structures and other inventory items such as road signs, etc.

Table 5-15: Predicted asset value comparing the provincial MTEF budget versus the optimised MTEF budget

Budget Item	All values in R million (rounded to nearest R100 million)			
	Provincial Allocation		Optimised Allocation	
	Paved Roads	Unpaved Roads	Paved Roads	Unpaved Roads
Current replacement cost (CRC)	R 162 600	R 7 900	R 162 600	R 7 900
Depreciated replacement cost (DRC)	R 133 800	R 1 200	R 133 800	R 1 200
DRC as a percentage of CRC	82%	15%	82%	15%
DRC 5 years	R 132 100	R 2 900	R 135 000	R 1 200
Change in replacement cost after 5 years	R -1 700	R 1 700	R 1 200	R -
Replacement cost after 5 years as a percentage of CRC	81%	37%	83%	15%
Change in replacement cost after 5 years - Total of paved and unpaved roads	R 0		R1 200	

Figure 5-33 shows the change in asset value of the road network in 2019 Rands for the different budgets.

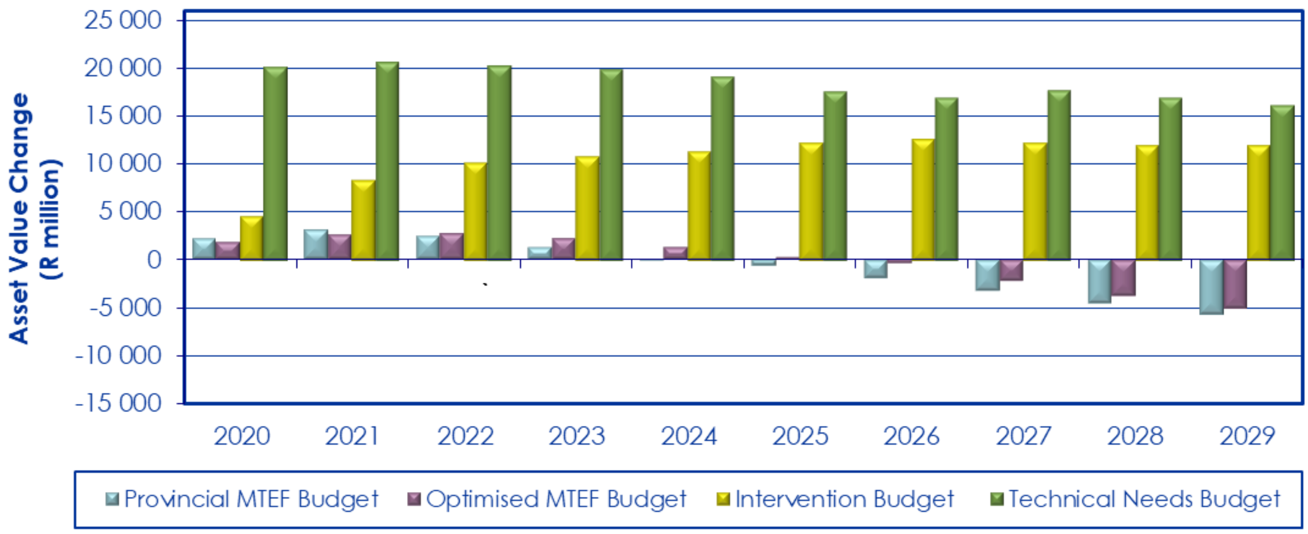


Figure 5-33: Change in asset value of the road network compared to 2019 value

- The current MTEF funding level cannot lead to an increase in asset value for both paved and unpaved road networks. This is due to the ongoing deterioration of paved roads that contributes to more than 90% of the current total network asset value.
- According to the analysis results, both the Intervention Budget and Technical Needs Budget will lead to increased asset value levels because the overall gravel thickness will increase and paved roads will be maintained at improved performance levels.

The predicted asset values in terms of depreciated replacement cost are detailed in Table 5-16. In the long-term the current funding level will result in a decrease in asset value for the road network as a whole.

Limitation: the predicted asset values do not include drainage structures and other inventory items such as road signs, etc.

Table 5-16: Asset value for 2019 versus predicted asset value after 5 years

Budget Scenario	Depreciated replacement cost (R million)								
	Current cost in 2019			Predicted in 2024			Change in asset value after 5 years		
	Paved roads	Unpaved roads	Total network	Paved roads	Upaved roads	Total network	Paved roads	Unpaved roads	Total network
Provincial MTEF Budget	R 133 800	R 1 200	R 135 000	R 132 057	R 2 855	R 134 911	R -1 743	R 1 655	R -89
Optimised MTEF Budget	R 133 800	R 1 200	R 135 000	R 135 042	R 1 194	R 136 236	R 1 242	R -6	R 1 236
Intervention Budget	R 133 800	R 1 200	R 135 000	R 138 469	R 7 753	R 146 221	R 4 669	R 6 553	R 11 221
Technical Needs Budget	R 133 800	R 1 200	R 135 000	R 144 520	R 9 606	R 154 126	R 10 720	R 8 406	R 19 126

The current allocation of the MTEF budget cannot prevent a future loss in asset value for paved roads. However, should funding be increased to achieve the intervention level, the asset value will increase to more than R146 billion by 2024.

The current MTEF funding level cannot improve network condition in the long-term (5+ years) and subsequently the asset value of the paved network is expected to decline (Figure 5-34), whereas the value of the unpaved network is expected to increase (Figure 5-35).

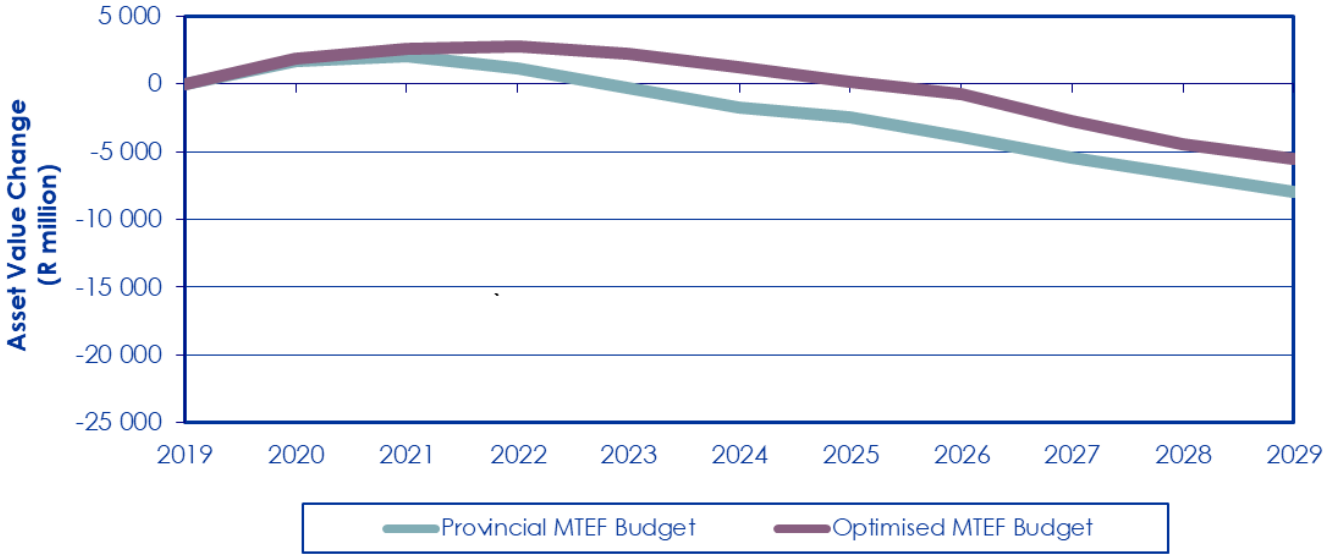


Figure 5-34: Change in asset value of paved roads

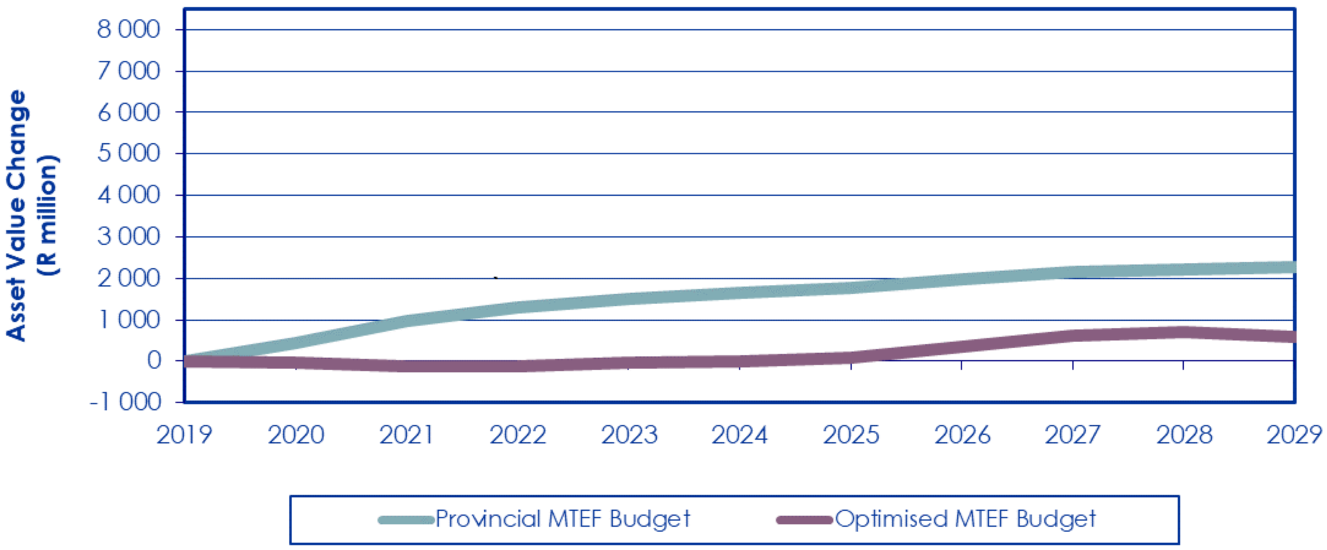


Figure 5-35: Change in asset value of unpaved roads

Consequences of different funding scenarios on excess user costs

The total predicted excess vehicle operating costs that the road users will bear after 5 and 10 years are shown in Figure 5-36. For the Provincial MTEF Budget, the cumulative excess user costs directly affecting the motorists, is expected to be almost R450million after 5 years and is expected to be just more than R2 billion after 10 years. These excess costs are a burden on the road users and the economy as a result of inadequate investment in maintaining the road network.

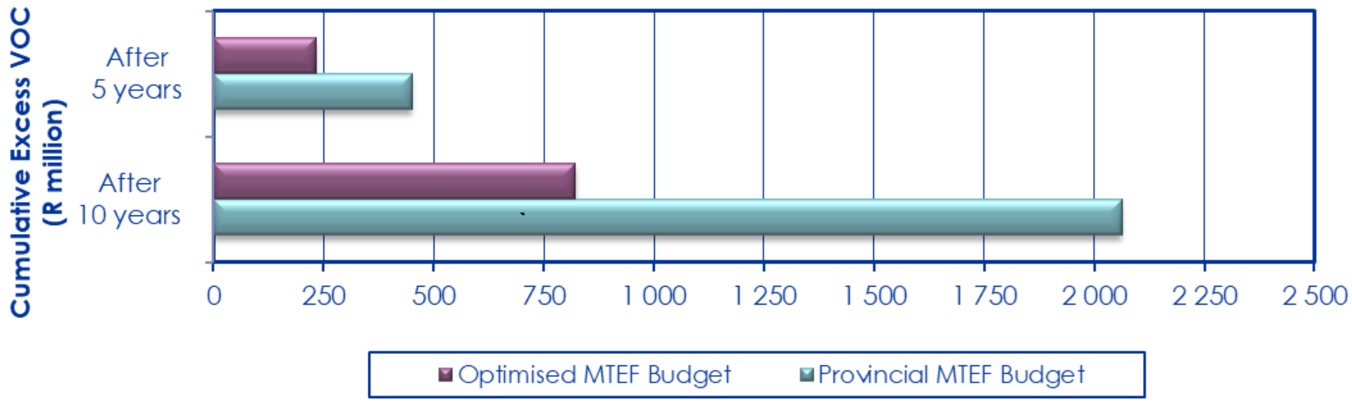


Figure 5-36: Total excess vehicle operating costs for the current funding levels on paved roads

5.1.19 Consequences of current funding level on the budget shortfall

Figure 5-37 presents the immediate need of the Branch's maintained road network, based on the 2018 visual assessment data. The budget shortfall is the difference between the current MTEF budget and the Technical Needs Budget.

The funding shortfall of the MTEF budget can therefore be calculated from the need according to the Technical Needs Budget (Table 5-13), i.e., the budget required to maximise road user benefits and to preserve the asset value.

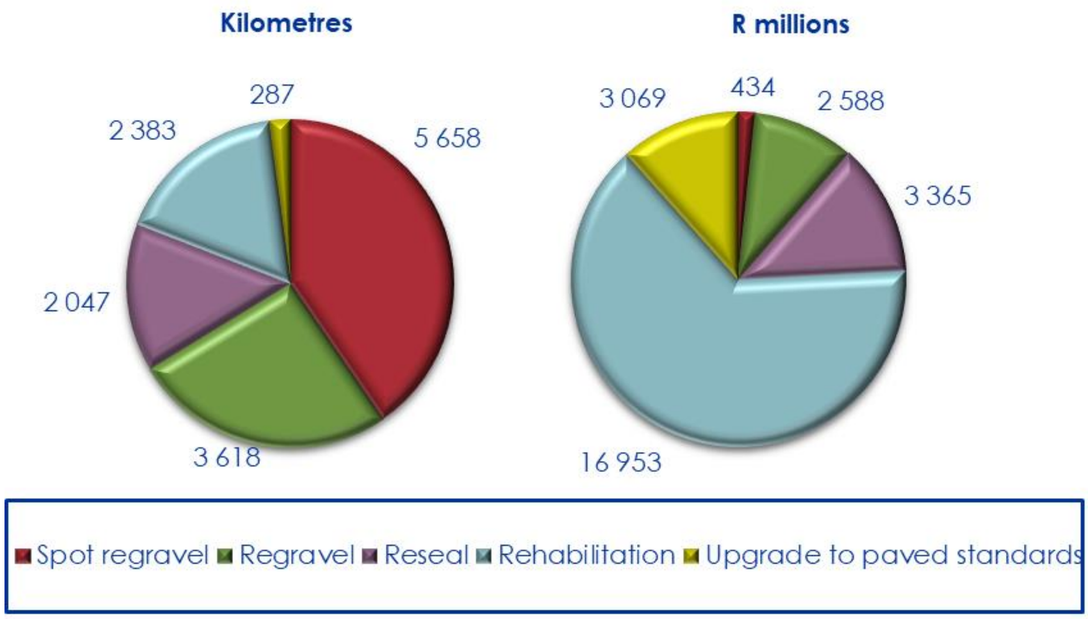


Figure 5-37: Immediate need according to the technical needs budget

The budget required to eliminate the backlog in maintenance on the network is shown in Table 5-13 on page 131.

The extent of the budget backlog was calculated as the difference in the fund allocation of the Provincial MTEF Budget Allocation and the Technical Needs Budget in 2020/21:

- The immediate need for gravel road maintenance is approximately R2 588 million for regravelling of 3 618 km of roads classified as medium and high LOS. An amount of R434 million is needed for spot regravelling of 5 658 km of roads classified as low and very low LOS.
- There are currently 287 km of unpaved roads where the benefit that would result from upgrading exceeds the benefit that is gained by regravelling. The funding demand of this activity is approximately R3 069 million.
- Roads experiencing structural deterioration and requiring rehabilitation account for more than 2 383 km of road and will require funding of approximately R17 billion.
- Since 2014/15, the budget backlog has increased significantly due to:
  - The change in the way that rehabilitation need is identified based on the 90th percentile roughness values;
  - Deterioration of the network leading to a greater need for rehabilitation and resealing; and
  - Increased costs.
- The immediate need for resealing is more than 2 047 km of road, requiring R3,3 billion. In comparison to the Technical Needs Budget, 100% of the need will be addressed over the next 5 years. Resealing is an important preventive measure to waterproof roads in a “fair” condition, delaying further deterioration. Once the opportunity to reseal a road has passed, the only option is expensive rehabilitation or reconstruction.

5.2 Summary of the paved and unpaved networks

Figure 5-38 shows the length of the paved and unpaved roads analysed in this RAMP versus the vehicle-km, asset value and MTEF fund allocation for the preservation of the road pavement structures and surfaces by means of regravelling, resealing, rehabilitation and upgrading of unpaved roads to paved standards.

For the current MTEF Budget, it has been found that the paved network cannot be maintained at the desired level of service and any funds used to maintain the unpaved network negatively impacts on the condition of the paved road network.

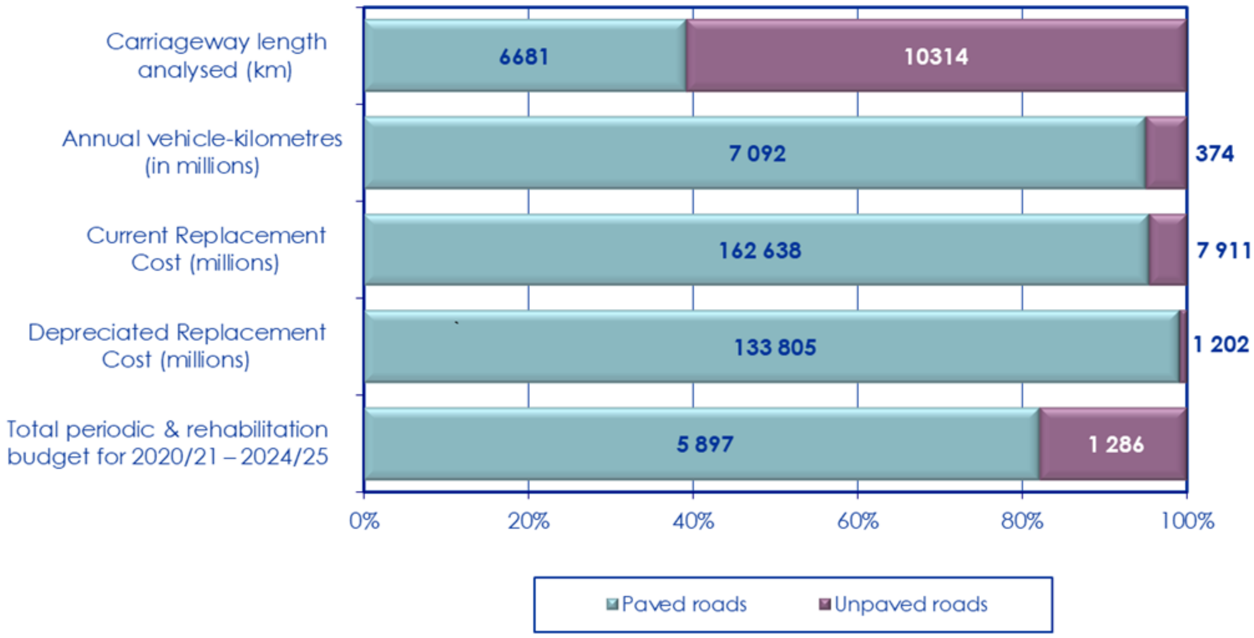


Figure 5-38: Comparison of paved and unpaved roads

5.3 Relationship of routine maintenance to condition

In this analysis, the ability of the Branch to conduct routine and emergency maintenance must also be considered. There is a direct relationship between the cost of pavement-related routine maintenance of the paved road network and road condition. For example, if the funding levels for resurfacing and rehabilitation are lower, the need for pavement related routine maintenance will increase and the following consequences are unavoidable:

- An ever-increasing need for routine maintenance will draw funds away from periodic maintenance and rehabilitation/ reconstruction.
- This will cause further deterioration of the surface condition of the road network that requires an accelerating need for additional funds.
- The future need for rehabilitation will accelerate, while the length of road that can be maintained with preventive maintenance, such as resealing, will decrease. The predicted future funding need will continue to increase.
- Teams responsible for routine maintenance will be inundated with demanding work, such as pothole repairs and patching. If these distresses are neglected the routine maintenance need will be amplified.

Table 5-17 shows the routine maintenance cost versus the proportion of the paved roads in poor to very poor condition, based on the data that has been adjusted for inflation.

Table 5-17: Routine maintenance cost versus proportion of poor and very poor paved roads				
% Poor and very poor paved roads	0	14	16	19
Averaged routine maintenance need per km per year (2019 rand)	8 034	15 045	17 327	18 872

The proportion of poor and very poor roads in a road network provides an indication of the overall condition of the network. An increase of 18% in unit rates since 2018 was adopted according to the unit rate increase observed in the province. As expected, the need for routine maintenance increases as the road network deteriorates. There will, however, always be a minimum need for routine maintenance even when paved roads are maintained at optimum levels. The current proportion of poor and very poor roads is 9.9% with an associated annual routine maintenance cost of approximately R15 045 per km (Figure 5-39). If the relationship is extrapolated linearly, it is expected that this cost will increase to approximately R20 000 by 2027 under the current funding policy. However, an exponential increase in routine maintenance cost is possible, implying that the linear extrapolation may under-predict the expected maintenance cost.

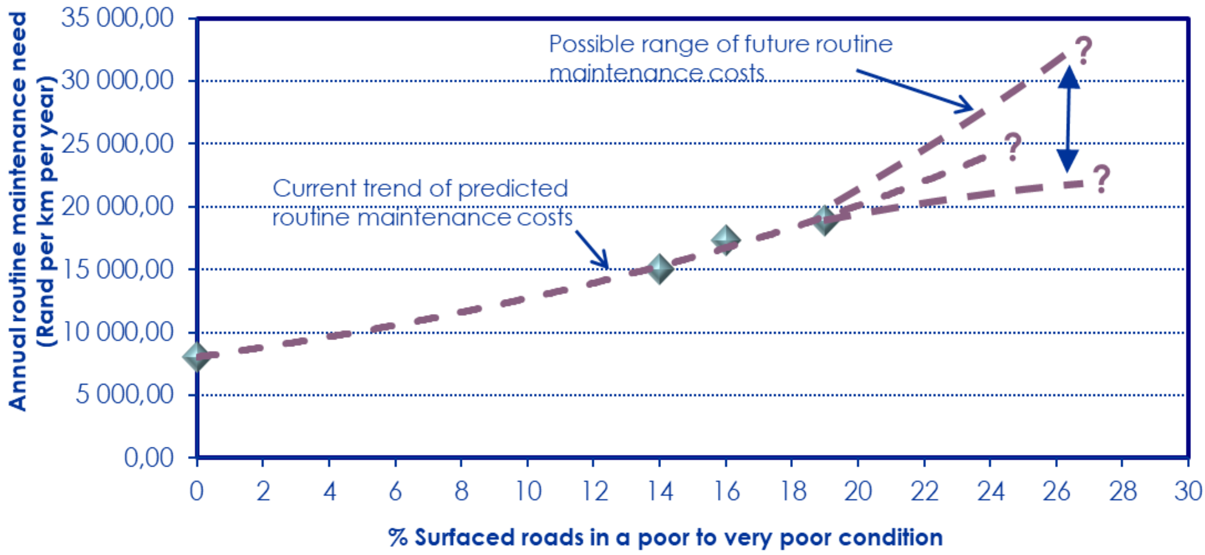


Figure 5-39: Routine maintenance cost versus condition of the paved road network

5.3.1 Recommended funding level for current assets

To remain competitive and derive the benefits from increased economic growth, the Western Cape will have to invest more in its road network than is currently the case.

In the long term, the funding level of the Intervention Budget is recommended as a "**Desired Budget**" for the resealing, regravelling, rehabilitation and upgrading activities of the Branch. The average annual funding determined for the Intervention Budget is R 3 700 million (excluding the other cost). This budget is approximately 242% more than the total MTEF funding. The recommended budgets for the paved and unpaved road networks are described below.

Paved road network

Approximately R2 200 million per annum to ensure the backlog of poor and very poor roads is kept to a minimum, provided preventive maintenance is done timeously. This comprises the following five year averages:

- R362 million for resealing

- R1011 million for light rehabilitation; and
- R 827 million for rehabilitation.

Unpaved road network

To ensure gravel wearing courses are maintained, R869 million per annum is required for regravelling and spot regravelling over the next five years. An amount of R631 million per annum is required to upgrade to pavement standards.

Bridge and other structures

Due to the lack of condition data, it is only possible to estimate a recommended funding level from the cost of previous work. This is estimated to be in the region 4% of capital works per annum, i.e. approximately R148 million per annum.

Other current assets

This is not included in the analysis and therefore cannot be estimated.

5.3.2 Candidate projects and Forward Works Programme

The list of candidate projects is the start of a process that leads to the Forward Works Programme (FWP) that is scheduled in the Roads Programme. Candidate Projects are an output from dTIMS that combines the identified sections into candidate projects.

The Forward Works Programme for all categories of work is provided in Appendix K – Forward Works Programme and alignment of projects.

5.3.3 Alignment of the candidate projects and the projects in RPM

A report has been compiled to check the alignment of the Candidate Projects with the scheduled projects in RPM as well as to identify candidate projects that have no corresponding project in RPM. These lists can be found in Appendix K – Forward Works Programme and alignment of projects.

5.4 Asset sustainability

The Asset Sustainability Ratio (ASR), expressed as a percentage, is defined as the capital expenditure (capex) on the replacement of assets (renewals) divided by depreciation expense. It is an estimate of the extent to which the infrastructure assets are being replaced as they reach the end of their useful lives. The depreciation expense represents an estimate of the extent to which the infrastructure assets have been consumed. Capital expenditure on renewals (replacing assets that the WCG already has) is an estimate of the extent to which the infrastructure assets are being replaced as they reach the end of their useful life.

$$ASR = \frac{Capital\ expenditure\ on\ renewals}{Depreciation\ expense}$$

The depreciation expense (DE) is calculated from roughness measurements as these relate directly to the need for renewal of the network. The formula for DE is:

$$DE = \frac{Current\ replacement\ cost \times (Current\ yr\ average\ roughness - Previous\ yr\ average\ roughness)}{Previous\ year\ average\ roughness}$$

Using the capex and depreciation expense for 2014/15 and 2017/18, adjusted for inflation, the ASR = 9,64% for this four year period. **This value indicates that the road network is being consumed far faster than it is being renewed**. A value of 50% or more is desirable.

Limitations

- The calculation of depreciation is based solely on the roughness, which was obtained in 2016.

- There is a large amount spent on periodic maintenance that contributes to sustainability by reducing the deterioration in roughness of the network, but this is not included in the calculation.

5.5 Plans for overload control infrastructure

Routine maintenance

Routine maintenance of the existing weighbridge facilities at Vissershok, Joostenbergvlakte, Somerset West, Rawsonville, Swellendam, Beaufort West, Moorreesburg and Klawer is undertaken as and when necessary. This includes periodic maintenance in the form of repainting and refurbishments.

Renewal and replacement plan

Nominal amounts are provided for future maintenance, renewal and replacement of equipment that fails or becomes unreliable. The multi-deck scales are verified every 6 months. Various modules of the new CSIR software have been implemented.

Upgrading and new facilities plan

- Low speed weigh-in-motion (LSWIM) screeners have been found to be effective for screening and it would be desirable to construct these at various facilities. This would entail the construction of a separate lane for heavy traffic.
- Further improvements at Rawsonville, Joostenbergvlakte and Somerset West have, however, been placed on hold until such a time when a decision of the future tolling of the N1 and N2 has been taken.
- A new facility is planned for Gouda.

5.6 Management of key moveable assets – Road plant

The Subdirectorate: Mechanical Services of the Transport Branch provides a mechanical support service in the Western Cape. This fleet is managed from Head Office Mechanical Services and used by the regional offices and district municipalities. A plant management and rental rate system is currently available and used to cost and measure utilisation. However, the operational costs are not currently charged back to ensure that the fleet can be renewed (i.e. every 20 years) where and when necessary, it is envisaged that this will be reinstated.

The impact of the poor rate of exchange between the rand and foreign currencies on the cost of plant is significant and it will become more difficult to replace plant in the future, even at the average interval of 20 years. Heavy vehicles and road maintenance machines are purchased according to the approved preference procurement policy, and according to the approved budgets of the three regional offices. Standard items are purchased by using the National Treasury Contract RT57. The rest of the equipment will be purchased by means of ad hoc tenders and quotations.

5.7 Demand for new assets

The increase in population as well as the expected growth in the economy of the Western Cape will translate directly into a greater demand for transport, and in particular road transport. The legislation and strategic initiatives that influence the demand for new assets are provided in paragraph 5.7.3.

5.7.1 Road Investment Strategy

The demand for new assets will in future be guided by the Road Investment Strategy – refer to paragraph 1.4.4 on developing asset management strategies.

5.7.2 Gap analysis for demand determination

The demand for capital improvements on the provincial road network is assessed in the categories described below.

Paved road upgrades

- Near or at road design capacity: increase paved road width on existing alignment; and
- Pavement design inadequate: upgrade pavement structure and improve alignment.

Unpaved road upgrades

- Traffic demand exceeds design parameters: upgrade road from unpaved to paved.

Road improvements

- These are normally short to medium term interventions to improve both safety and level of service along the road or at intersections and usually include one or more of the following improvements:
  - Provision of service roads;
  - Provision of turning lanes and stop line capacity;
  - Provision of walkways;
  - Provision of cycleways;
  - Provision of bus lanes;
  - Provision of lay-bys or viewpoints on scenic roads; and
  - Upgrading of intersection control, e.g. stop street to traffic signal control, or changing ramp configurations to improve traffic flow.

New works

There are two drivers for new works, namely:

- Completing the road network, i.e., missing road links; and
- As an enabler for future growth and development.

The Branch identifies new regional infrastructure required to support growth and development through community liaison such as the municipal integrated development planning (IDP) process, which receives both community and political support. Projects such as new road links, link capacity upgrades, safety improvements, etc., are selected based on their alignment with medium- to long-term priorities such as those described in the Provincial Strategic Goals, Provincial Spatial Development Framework and the envisaged Road System Management Strategy.

To further refine the scope for each project and to verify its feasibility, specialist service providers are appointed to assist the Roads Branch with the planning process by conducting a feasibility study that examines the travel demand and benefits generated by future growth and development, in comparison to the expected costs and performance.

Various road policies and objectives, such as public transport first, improve safety, reduced congestion, improved accessibility, reduced travel time, etc., inform the road class and design standards applied. A lifecycle benefit-cost analysis is undertaken in HDM-4 to optimise the proposed alternatives. Alternatives that derive economic benefits less than the social discount rate are disregarded. The outcome is the identification of a preferred road network intervention, which is technically feasible, economically viable, and which has minimal environmental impacts.

Feasible projects are prioritised by Branch management and combined into a programme for input to the Road Investment Programme.

5.7.3 Framework for development of a Demand Management Plan

The framework for the DMP is described below.

- Legal framework

  - In terms of section 27 of the National Land Transport Transition Act, 2000, (NLTTA) (Act 22 of 2000), the integrated transport plans (ITPs) of municipalities are integrated into their IDPs.
  - Future versions of the Provincial Land Transport Framework (required by section 22 of the NLTTA), must incorporate information from the ITPs, as well as inform future ITPs.
  - Constitution, PFMA, Government Immovable Asset Management Act, 2007 (GIAMA) (Act 19 of 2007), NDP, Sustainable Development Goals, National Strategic Goals, Provincial Strategic Goals;
  - Spatial Planning and Land Use Management Act, 2013, SPLUMA (Act 16 of 2013), Local Government: Municipal Systems Act, National Land Transport Act, IDPs, ITPs, Provincial Land Transport Framework (PLTF), National Land Transport Strategic Framework (NLTSF);
  - National Environmental Management: Biodiversity Act, 2004, (Act 10 of 2004), National Environmental Management Act, 1998 (NEMA) (Act 1998), Department of Mineral Resources (DMR), Department of Water Affairs and Sanitation water licence requirements, etc.
- Strategic initiatives:
  - National Spatial Development Framework (NSDF);
  - The Provincial Strategic Infrastructure Plan;
  - The Provincial Spatial Development Framework (PSDF), developed by the Department of Environmental Affairs and Development Planning;
  - The Micro Economic Development Strategy (MEDS);
  - Provincial Strategic Objectives; and
  - National and Provincial Freight Corridor Study.
- Roads Branch governance:
  - Strategic Goals, maintenance policies, capital investment policies, MTEF allocations, procurement management systems.
- Technical framework
  - Road System Management Strategy (to be developed) that contains:
    - Road network classification and associated LOS, geometric design standards, maintenance standards, Road Network Optimisation Model, project prioritisation methods, Asset Management System;
  - Roads Ordinance, Expropriation Act, 1975 (Act 63 of 1975), Road Traffic Act, Southern African Development Community road signs and marking, Road Access Guidelines, National Transport Master Plan (NATMAP), RISFSA, RCAM, draft TMH 22, TRH 22, etc.
  - Integrated Design Management System (IDMS), Portfolio and Project Management System to monitor measures of effectiveness: within time, on budget and to required standards that support the coordinated and integrated planning and delivery of infrastructure projects across all sectors and spheres of government to achieve the desired NDP and PSG outcomes.
  - Project procedures manual to administer, plan, design and deliver road network infrastructure and associated services.
- Institutional framework:
  - Resources to administer, plan, design and delivery road network infrastructure and associated services.

5.7.4 Demand Management Plan

Overall strategic development priorities, population trends, transport modes, and the informants of national travel surveys, will be included in the envisaged DMP. Requirements of the PSDF and Municipal Spatial Development Framework (MSDF), and the district ITP, emphasise the need for traffic modelling to be undertaken to assess the impact of spatial policies and future densification strategies along the road network corridors.

A province-wide transport model, the Western Cape Transport Model (WCTM), will be used to analyse the impact on the capacity of the existing road network to accommodate traffic demand from future growth and development. The future traffic demand requirements will be used to develop a Demand Management Plan, which will in turn inform the Branch's Investment Strategy for new assets. The WCTM will be used to test the impact of planned future land use scenarios and transport solutions and spatial policies to establish:

- Their impact on road capacity and access requirements;
- The need to expand the road network in support of the growth and development policies of the Western Cape;
- Any functional and operational system changes required;
- Projects that the local municipalities have identified to promote development as contained in their IDPs and ITPs;
- Candidate projects identified by dTIMS on the basis of traffic, average maintenance costs and vehicle operating costs
- Maintenance related upgrades identified by the DREs/DMs. These are sections of the network that incur excessive maintenance costs due lack of suitable gravel materials for maintenance or remote location; and
- Public-private partnerships, where projects are co-funded by companies, private individuals, farmer forums and special needs road-user groups, enabling the projects to become economically feasible.

Note: It is important to note that appropriate standards must be applied to each upgrade. For example, unpaved roads carrying high levels of traffic would be upgraded to normal standards, whereas maintenance-related upgrades to roads carrying little traffic would be upgraded to a much lower standard, both in terms of cross-section, alignment and pavement structure. In the latter case, it is much more important to reduce maintenance costs than to achieve a high LOS.

The identified new infrastructure is further refined into feasible projects as follows:

- The road policies and objectives, such as public transport, safety improvements, reduced congestion, improved accessibility, reduced travel time, etc., inform the road class and design standards that are required.
- Service providers are appointed to assist the Roads Branch with the planning process to produce a feasibility study to determine the travel demand generated by future growth and development as well as a cost estimate of the project.
- The outcome of the feasibility stage is a preferred road network intervention, which is technically feasible, economically viable and with minimal environmental impacts.
- Feasible new works projects are then included in the dTIMS analysis where they compete with other types of projects to maximise the total benefit to the network within the constraints of the MTEF Budget.

5.7.5 Demand prioritisation and resource allocation

In future, it is envisaged that with the implementation of the Western Cape Transport Model, the modelled outcomes from the gap analysis will determine the infrastructure needs to meet the future traffic demand, driven mainly by growth and development. These outcomes can be included in the life cycle analysis of the road network in the resource optimisation analysis in dTIMS to facilitate a more comprehensive trade-off analysis between new roads, upgrading of paved roads, safety improvements and routine maintenance in addition to rehabilitation, upgrades to unpaved roads, and periodic maintenance. The planning process for capital projects is represented diagrammatically in as a funnel through which the pool of candidate projects flow to become scheduled programs of projects.

The transport model is used to undertake a gap analysis to determine the future road network demand in support of growth and development. A gap analysis is used to systematically determine the nature, size, and timing of the "gap" between current capacity and future needs of the road network. How the road network gap is cost effectively closed is the all-important other half of the story involving rigorous investment decision-making. A good capital investment framework process will:

- systematically address the core funding questions of "Which projects? Why? At what level? When?";
- assist the Branch in striking a rational balance between capital and operating/ maintenance requirements and between renewal and expansion demands; and
- assist the Branch to motivate the road network capital investment programme to customers and elected officials with a high level of confidence in the quality of the investment decisions.

Project options analysis

Using HDM-4, conduct a comparative analysis of potential project options. Appraise and evaluate each option to determine the optimal technical solutions:

- Minimise the cost over the lifecycle of the solution;
- Maximise the benefit-cost ratio;
- Mitigate environmental impacts by undertaking an EIA; and
- Maximise social impacts such as job creation and economic growth.

Network level analysis to identify strategic priorities

The optimisation of resources among the treatments used to preserve the current assets and the new assets will be done using dTIMS to conduct a comparative review of identified improvement projects on the road network with economic lifecycle benefit-cost evaluation, including the implications of the "do nothing" option.

- Input: Road identity data (classification, length, width, surface, capacity, etc.), classified traffic counts, travel demand, vehicle operating costs, weather conditions, existing road condition, pavement deterioration models, maintenance strategies, technical road standards, levels of service.
- Output: Preferred alternative that is technically feasible, economically viable with minimal environmental impacts in compliance with the Constitution and the PFMA.

In terms of maximising the utility or the benefit derived over the life of an intervention, the expected road user costs are calculated over the lifecycle of the solution or asset using the road:

- Savings of VOC;
- Savings in time-costs; and
- Reduced accident costs.

Criteria: Net present value > 0 and benefit cost ratio > 1, mutually exclusive projects, internal rate of return (IRR) > discount rate (8%). Generally, test NPV > 0 for VOC only then do a sensitivity test VOC + Time and VOC +Time + Accidents. This gives an indication of the robustness of assumptions.

5.7.6 Current priorities for new assets

The City of Cape Town's functional area that includes the municipalities of Swartland, Drakenstein, Stellenbosch and Overstrand, plays an important role in demand management strategies as the City places a high priority on transit-oriented-development and its associate land use densification strategies to enable long-term public transport and intermodal planning. In the regional context, the demand is influenced by the Growth Potential of Towns Study and the priorities outlined in district and municipal ITPs. The transport plans of municipalities are developed during joint-planning initiatives with the nine provincial departments under the facilitation of the Department of Local Government.

In the absence of the DMP, a list of known high priority improvements, i.e. possible future projects are shown in Table 5-18. The total cost estimate is approximately R16,3 billion.

Table 5-18: Possible future capital improvements					
Description	**Category**	**Cost Estimate 2018 Rand (millions)**	**Desired Commence-ment Year**	**Funded by Province**	**Notes**
George Western Bypass	New Asset	730	2023	100%	Identified in IDP for economic growth of George
Upgrading of MR201 Paarl to Wemmershoek	Paved Road Upgrade	560	2022	85%	Required for economic growth and development in Drakenstein (Drakenstein Municipality contributes R80 millions)
Extension of R300 North	New Asset	1 100	2022	100% [2]	Essential for the growth and development of Cape Town and to connect urban areas
Malmesbury bypass	New Asset	350	2022	100%	Freight route linking the Saldanha Bay area to other major inter-regional transport routes
Relocation of TR28 to bypass Hermanus	New Asset	210	2023	100%	Establish the long-term regional mobility for the Overstrand area
Realignment of the link between R27 (West Coast Road) and the N7	Paved Road Upgrade	200[1]	2024	100% [2]	This realignment/dualling that will link to R300 North Extension, and is essential for the growth of the Northern corridor and evacuation from Koeberg Power Station
Dualling of MR174 Between N1 to Stellenbosch	Paved Road Upgrade	300	2023	100%	Reduction of congestion during peak traffic, and for safety.

Table 5-18: Possible future capital improvements					
Description	**Category**	**Cost Estimate 2018 Rand (millions)**	**Desired Commence-ment Year**	**Funded by Province**	**Notes**
Extension of Berkeley Road towards Observatory	New Asset	160[1]	2023	40%	Essential element for the development of the Voortrekker Rd economic development corridor. 40% Subsidy to CoCT
N7 Northern Growth Corridor	New Asset/ Paved road Upgrades	1 040	2022	100% [2]	Safety improvements (i.e. Freeway standards) and the evacuation from Koeberg Power Station
Wingfield Southern Growth Corridor	New Asset/ Paved road Upgrades	11 650	2022	100% [2] phased over multiple years unless DTPW receive contributions from external stakeholders	One of the first mega infrastructure projects that form part of the Cape Town Freeway Integrator

1 – Cost estimate based on 2016 rates.

2 – Unless funding is received from Budget Facility for Infrastructure as described in paragraph 7.4.2.

The Desired Budget for new infrastructure and the estimated cashflow up to 2028 is shown in Table 5-19.

Table 5-19: Desired funding for new infrastructure

Category	Budget allocations per fiscal year (millions)							
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	Total
Not yet scheduled	399	1 000	1 000	-	-	-	-	2 399
Scheduled	61	310	380	370	410	320	-	1 851
Total	460	1 310	1 380	370	410	320	-	4 250

The Desired Budget for paved road upgrades up to 2028 is shown in Table 5-20. This budget is based on improving the level of service on roads that have congestion and/or safety issue

Table 5-20: Desired budget for upgrades to existing infrastructure

Category	Budget allocations per fiscal year (millions)							
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	Total
Not yet scheduled	2 397	1 275	1 275	1 200	1200	1200	1 200	9 747
Scheduled	325	399	502	630	730	660	-	3 246
Total	2 722	1 674	1 777	1 830	1 930	1 860	1 200	12 993

5.8 Project packaging and scheduling

5.8.1 Project packaging

Prior to the finalisation of projects, consideration should be given to project packaging:

- Confirmation of treatment recommendations through panel inspections, where appropriate; or more detailed engineering investigations for more complex treatments, which might move these candidates to later years due to time required for design and contractor procurement.
- Visual inspections are undertaken by panels:
  - The panel inspection for paved roads includes personnel from Planning, Design, Program and Systems Support, as well as from the regional offices.
  - The panel inspection for unpaved roads includes personnel from the Systems Support Subdirectorate, the regional offices, the district municipalities, as agents of the WCG, as well as political representatives of the district municipalities.
- Compilation of viable projects, through merging of candidate projects across treatment types and years to achieve economy of scale.
- *Ad hoc* inclusion of identified work on structures.

5.8.2 Project scheduling

The initial scheduling of projects in the Roads Programme takes place after the final scope of each project has been approved. There are many subsequent phases of project scheduling over the full project lifecycle that covers all the stages from inception to completion of the work.

Where projects require funding in excess of the annual budget of a specific subprogramme, the budgets are adjusted (within limits) to suit the projects in question. Specific priorities identified by the Branch may also be accommodated and the funding adjusted for each subprogramme.

While the priority order in which projects should ideally be implemented is determined during the optimisation process, there are many “real-world” factors that influence the scheduling of projects within an implementation programme. The scheduling process considers all the factors exogenous to the prioritisation process that affect scheduling in the programme. The importance of each factor can vary at any time from the initial scheduling until the project has been completed:

- Availability of design and contract documentation for the project: non-performing consultants can cause delays in project design.
- Statutory processes: unexpected delays caused by, e.g., changes in legislation, expropriation, environmental and stakeholder participation processes can cause projects to be delayed. When this happens, it can cause a reprioritisation of the rest of the programme in terms of affordability, risk, etc.
- Ring-fenced budgets: Projects are prioritised in response to "use it or lose it" funding, which may not be compatible with the "real" priority of the project. The requirement is to spend the allocated budget in a specific financial year, or run the risk of losing the funding.
- Strategic importance: some projects are prioritised to support the strategic initiatives of other spheres of government, such as, e.g., the Saldanha Industrial Development Zone (IDZ).
- Affordability: Projects are slotted into a programme where they can be accommodated in terms of the expected cash flow of existing financial commitments and the available funding, which, in turn is affected by other factors, namely:
  - Differences in pre-tender cost estimates versus tendered amounts awarded to contractors;
  - Sudden increases or decreases in available funding;
- Construction delays: non-performing contractors can cause delays during construction leading to the reprioritisation of other projects;
- Risk: projects are scheduled in a manner that seeks to minimise the risks of, e.g., the following:
  - Congestion caused by construction activity;
  - Shortages of materials such as bitumen;
  - Overloading the construction capacity of the local construction industry;
  - Weather, e.g., resealing projects can only be undertaken during the summer months;
  - Not spending conditional grants; and
- Social factors: it is desirable for projects to be distributed spatially to ensure that contractor development, targeted procurement and job opportunities are, as far as possible, distributed fairly.

There are a number of possible variations of scheduling that are listed under their separate headings below.

Routine maintenance for roads

The routine maintenance of unpaved and paved roads includes the blading of unpaved roads, minor bridge repairs, grass cutting, road marking, traffic signs maintenance, etc.

Routine maintenance inspections are carried out weekly by the officials actively involved in these actions. The maintenance actions required are identified and are supplemented with actions required to address complaints received from the public. Routine maintenance actions are then prioritised as follows:

- First priority: actions required to safeguard the travelling public. These include repairs to road traffic signs, filling of potholes, the blading of unpaved roads, and other actions required to make the road prism safe for use; and
- Second priority: actions in the road reserve, such as grass cutting, opening up of drainage structures, rubbish removal, etc.

Funds are distributed according to technical norms such as traffic volume, road length and socio-economic factors, such as the use of the road by agriculture, tourism, etc.

Minor roads, which the Branch is not compelled to maintain, have, for many years, due to funding and logistical restrictions, received very little attention. The public, organised labour and tourism organisations see some these roads as essential. Complaints about their condition are received regularly. Where necessary, minimal expenditure is spent on maintaining minor roads if funds are available.

Bridge maintenance

Structures and major culverts inspections has been undertaken by accredited professionals. The resulting information will be stored in the Bridge Management and Structures Management System (B&SMS).

Projects will be identified from the B&SMS and prioritised on the basis of safety and technical requirements. Depending on the urgency of maintenance projects, funding is made available to allow the maintenance to be carried out timeously. Future developments will integrate the outputs for the B&SMS with dTIMS.

Road safety improvements

From the accidents database, high-frequency accident locations are identified. On-site inspections of these locations are periodically undertaken, where the most urgent projects will be prioritised on the basis of their potential impact on road safety. Where necessary, consulting engineers are appointed for detailed investigations and preparation of designs, specifications and cost estimates.

Road safety improvements are normally included in the scope of rehabilitation and upgrading projects.

Contributions to the Cape Town MTAB

In terms of the Urban Transport Act, 1977 (Act 78 of 1977), the City of Cape Town is the core city for the Cape Town Metropolitan Area. The WCG, represented by the Branch, is part of the Metropolitan Transport Advisory Board (MTAB). From time to time, planning projects, and/or joint or special, (e.g. the 2010 Soccer World Cup), projects are undertaken, requiring part funding by the Branch. Such projects and the required funding are negotiated between the two parties.

Contributions to municipal rehabilitation and periodic maintenance

Transfer payments are made to municipalities, including the City of Cape Town, for the rehabilitation and periodic maintenance of proclaimed municipal main roads within municipal areas. These are subsidies on expenditure payable to municipal councils that are road authorities for main roads in terms of the Roads Ordinance. Allocations are placed on a priority listing system and based on condition data. The municipalities usually provide 20% of the costs and the WCG subsidises the other 80%.

5.9 Changes in technology

Road-based transport is expected to remain the primary mode of transport for both passengers and freight in the Western Cape. No foreseeable changes in technology will reduce or, for that matter, increase the need for road infrastructure over the next ten years. The Branch continuously monitors new transport-related technologies that arise from time to time.

5.9.1 In-line crusher

The most common defect present on the network is 'stoniness fixed' (Figure 4-39) and can be as a result of an excess of oversize materials and exposed, rocky subgrade. This excess of oversize material is the consequence of poor processing of the material, where it may be hard to break down the hard, oversize material with a grid roller and crushing has not been used.

As mentioned previously, the Branch have initiated investigations in breaking down the oversize material with an in-line crusher. These investigations will include the ripping up of exposed rocky subgrades, crushing of oversized material to achieve the specified particle size using the inline crusher, supplementing the crushed material with imported gravel wearing course, blending the material and regraveling. The in-line crusher and the final product from this alternative method of construction is shown in Picture 5-3 and Picture 5-4.

Picture 5-3: In-line crusher

Picture 5-4: Processing the in-situ subgrade using an in-line crusher

A series of sites have been identified for the trial investigation and the performance of this alternative maintenance approach will be monitored and evaluated.

5.9.2 Pont Malagas

The Department is one of the only clients in South Africa that still have a pont, this a vessel that replaces the function of a bridge, near Malagas. The current operating pont is more than 100 years old, which is pulled by hand, by means of a cable over the river and can be loaded with 10 tons at a time.

As the pont is at the end of its repairable life, the Department decided to replace it with new technology and specification. The new pont will be able to transport 20 tons, including the transportation of construction graders, that maintain the gravel roads nearby. The pulling of the Pont across the river by hand has been replaced by a diesel driven engine. This new form of propulsion has brought about greater safety for the public, by not having a cable that can cause harm to others. The propellers are also able to be moved vertically and inclined to reduce any "scouring" of riverbanks in shallow waters and docking.

Below is a picture of the old and new pont.

Picture 5-5: Old Pont

Picture 5-6: New Pont

Chapter 6 – Asset management plans

6.1 Closing the gap

6.1.1 Road infrastructure

The level of service that is provided has a great influence on the level of expenditure required. In this report three scenarios were considered:

- The current trend in MTEF allocations to the Branch continues;
- An Optimised MTEF Budget is put in place, where the total transportation cost to society is minimised; and
- A desired budget, i.e. the Intervention Budget becomes possible.

Should additional funds be made available to implement the Desired Budget, it is intended to phase in the additional work over a period of 10 years. This would ensure that the capabilities and capacities of the Branch and its agents, the district municipalities, and those of private contractors are not exceeded. This phasing is reflected in the estimates of future expenditure.

Appendix K – Forward Works Programme and alignment of projects shows indicative lists of current projects for roads and for overload control.

6.1.2 Projected 10 year budget allocations

The expected budget allocations most likely to be available for the next 10 years are shown in Table 6-1.

Table 6-1: 10-year plan for various treatment categories

Treatment	Budget allocations per fiscal year (R X thousands)									
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Resealing	1 189 675	881 850	847 215	628 525	612 000	671 650	718 666	768 973	822 801	880 397
Rehabilitation	522 018	676 605	537 158	282 762	157 012	293 421	313 960	335 938	359 453	384 615
Regravel	137 150	144 240	149 965	187 460	195 335	203 600	217 852	233 102	249 419	266 878
Upgrading to paved	232 000	219 000	224 000	174 000	246 000	259 000	277 130	296 529	317 286	339 496
Other	1 872 277	2 238 862	2 564 478	2 785 072	3 079 665	2 921 844	3 126 373	3 345 219	3 579 385	3 829 941
Total	3 953 120	4 160 557	4 322 816	4 057 819	4 290 012	4 349 515	4 653 982	4 979 761	5 328 344	5 701 328
AFR	300 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000
PRMG	960 309	1 007 887	1 059 248	1 059 248	1 059 248	1 059 248	1 059 248	1 059 248	1 059 248	1 059 248
Overload control	32 395	32 458	33 915	35 611	37 391	39 261	42 009	44 950	48 096	51 463
Note: All figures after 2027/28 were estimated by using an escalation of 7% per annum.										

6.1.3 Plans for Expanded Public Works Programme and Provincial Road Maintenance Grant

The Branch will continue to contribute in creating employment through the Expanded Public Works Programme (EPWP) in conjunction with the requirements of the Provincial Road Maintenance Grant (PRMG). In terms of the Preferential Procurement Regulations, the DTPW plans to develop an Empowerment Impact Assessment (EmpIA) Tool to facilitate provincial coordination and monitoring of EPWP activities amongst all implementing bodies. Prioritised PRMG projects for the MTEF budget are shown in Appendix L – Gazetted list of projects.

6.2 Management of Road Asset Management System

Data for the RAMS is collected systematically according to the required methods and frequency (Table 3-1 and Table 3-2), verified and stored in a State Information Technology Agency (SITA)-managed database. The various systems (RNIS, PMS, GRMS, B&SMMS, TCS, PAS, etc.) access and process the data into information that is stored on the database. This process has been going on and expanding since the first system was introduced in the 1980s. The data requirements have now stabilised and this data will continue to be collected as an essential input to the management of the road network according to best practice in asset management (refer to draft TMH 22 Asset Management (Committee of Transport Officials, 2013) and ISO55001 (International Standards Organization for Standardization, 2015)). See also paragraph1.6.

6.3 Asset transfers

No transfers of assets are currently being envisaged.

6.4 Disposal plan

Road infrastructure has a very long life, and seldom becomes obsolete in function. Whenever sections of road become obsolete due to a replacement road being built on a changed alignment, the old road is ploughed up, and bridges and culverts demolished. The costs of these disposal actions are included in the construction costs of the replacement or new facility. The road reserve of such road sections is then de-proclaimed and returned to their original owners, or their legal successors. The value of land returned is offset from the cost of any new expropriated land.

Chapter 7 – Financial summary

7.1 Financial statements and projections

7.1.1 Key assumptions

The financial requirements for road infrastructure, as set out in Table 7-3 and Table 7-4 are based on detailed optimisation procedures, which are in turn based on detailed network information. The network information is, in the end, the key to the accuracy of the resulting financial requirements. The following items of information are especially important:

- Road network information;
- Road conditions;
- Traffic volumes;
- Estimates of costs for maintenance, renewals, replacements, upgrading and new facilities; and
- The LOS to be provided.

7.1.2 Roads infrastructure

Routine maintenance, the renewal or replacement of roads, the upgrading of roads, and the provision of new facilities do not happen in isolation. To enable these actions to take place requires programme support expenditure, planning expenditure and design expenditure.

The tables below show the expected MTEF allocation at current levels, the required funding, and the additional funding required, for the following aspects of road infrastructure:

Enabling expenditure, consisting of expenditure on:

- Programme support (Table 7-3A);
- Planning (Table 7-3B); and
- Design (Table 7-3C).

Routine maintenance expenditure (Table 7-3D).

Renewal and replacements expenditure (Table 7-3N) consisting of expenditures on:

- Regravelling (Table 7-3E);
- Resealing (Table 7-3F);
- Light Rehabilitation (Table 7-3G);
- Bridge maintenance (Table 7-3H);
- Rehabilitation and reconstruction of paved roads (Table 7-3I);
- Access and development projects (Table 7-3J);
- Road safety improvements (Table 7-3K);
- Contributions to the Cape Town MTAB (Table 7-3L); and
- Contributions to municipalities for rehabilitation & reconstruction (Table 7-3M).

Upgrading and new facilities (Table 7-3R), consisting of expenditure on:

- Unpaved road upgrading (Table 7-3O);
- Paved road upgrading (Table 7-3P); and
- New facilities (Table 7-3Q).

Table 7-1 below shows a summary of the funding required to achieve the Desired Budget for roads (totals for Vote 10: Programme 3: Roads). Considerable additional funding will be needed to achieve the desired level of service. The average shortfall in funding provided for roads in the Western Cape over the next 10 years is of the order of R4,2 billion per year in 2021 Rand.

Table 7-1: Funding required to achieve the desired budget for roads (totals for Vote 10: Programme 3: Roads

Financial Year	MTEF budget 2021, Rands	Desired funding, Rands	Additional funds required, Rands
2022/23	3 970 732	8 891 059	5 935 450
2023/24	4 145 292	8 758 178	5 338 210
2024/25	4 246 385	8 989 329	5 487 419
2025/26	3 949 899	7 947 711	4 573 457
2026/27	4 113 398	8 176 756	4 682 252
2027/28	4 262 125	8 101 137	3 858 080
2028/29	4 560 474	7 619 015	3 078 944
2029/30	4 879 708	7 893 268	3 035 391
2030/31	5 221 287	8 445 797	3 247 869
2031/32	5 586 778	9 037 003	3 475 220

7.2 Overload control

The tables, as indicated below, show the expected MTEF allocation at current levels, the required funding, and the additional funding required, for the following aspects of overload control:

- Routine maintenance (Table 7-4A);
- Renewals and replacements (Table 7-4B);
- Upgrading and new facilities (Table 7-4C); and
- Operational Expenditure (Table 7-4D).

Table 7-2 shows a summary of the financial resources required if the desired budget and maintenance scenario for overload control is to be achieved. It follows from the figures shown in Table 7-2 that additional funding for overloading control will have to be provided to realise the desired level of service.

Table 7-2: Funding required to achieve the desired budget for overload control (totals for Vote 10: Sub-programme 5.4: Overload control)			
Financial Year	MTEF budget 2022, Rands	Desired funding, Rands	Additional funds required, Rands
2022/23	32 395	53 823	21 428
2023/24	32 458	56 705	24 247
2024/25	33 915	59 746	25 831
2025/26	35 611	63 381	27 770
2026/27	37 391	67 238	29 847
2027/28	39 261	71 945	32 684
2028/29	42 009	76 981	34 972
2029/30	44 950	82 369	37 419
2030/31	48 096	88 134	40 038
2031/32	51 463	94 304	42 841

It is foreseen that, in future, upgrading and new facilities for overloading control will be funded as Road Infrastructure.

The only way the additional funds required for overloading control infrastructure could be funded, would be by means of additional grants by Provincial Treasury.

7.3 Cash flow forecasts

The cash flow forecast, desired funding estimates and the additional funds required are provided in Table 7-3 for the road network and in Table 7-4 for overload control.

Table 7-3: Cash flow forecasts and desired funding estimates

Average MTEF inflation increase*	7%	All monetary values are in currency of the year shown

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3A	Programme support (Vote 10, Prog 3, Sub-prog 1, 4, 5)	MTEF	141 593	144 323	150 852	61 130	64 195	67 397	72 115	77 163	82 564	88 344
		Desired Funding	146 361	149 424	155 953	66 588	70 035	73 646	78 801	84 317	90 219	96 535
		Additional funds required	**4 768**	**5 101**	**5 101**	**5 458**	**5 840**	**6 249**	**6 686**	**7 154**	**7 655**	**8 191**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3B	Planning (Vote 10, Prog 3, Sub-prog 2)	MTEF	57 944	59 576	62 135	114 968	120 720	126 756	135 629	145 123	155 282	166 151
		Desired Funding	59 914	61 684	64 243	117 224	123 133	129 338	138 392	148 080	158 445	169 536
		Additional funds required	**1 970**	**2 108**	**2 108**	**2 256**	**2 413**	**2 582**	**2 763**	**2 957**	**3 164**	**3 385**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3C	Design (Vote 10, Prog 3, Sub-prog 3)	MTEF	219 629	210 223	219 025	288 882	303 327	318 494	340 789	364 644	390 169	417 481
		Desired Funding	221 171	211 873	220 675	290 648	305 216	320 515	342 951	366 958	392 645	420 130
		Additional funds required	**1 542**	**1 650**	**1 650**	**1 766**	**1 889**	**2 021**	**2 163**	**2 314**	**2 476**	**2 650**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3D	Routine maintenance	MTEF	954 573	986 300	1 050 080	1 095 172	1 146 809	1 202 807	1 287 003	1 377 094	1 473 490	1 576 635
		Desired Funding	1 323 577	1 381 764	1 415 462	1 316 633	1 371 133	1 420 708	1 520 158	1 626 569	1 740 429	1 862 259
		Additional funds required	**369 004**	**395 464**	**365 382**	**221 461**	**224 324**	**217 901**	**233 155**	**249 476**	**266 939**	**285 625**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3E	Regravelling	MTEF	137 150	144 240	149 965	187 460	195 335	203 600	217 852	233 102	249 419	266 878
		Desired Funding	987 928	951 068	888 211	703 528	1 077 732	787 912	699 768	772 650	826 735	884 607
		Additional funds required	**850 778**	**806 828**	**738 246**	**516 068**	**882 397**	**584 312**	**481 916**	**539 548**	**577 316**	**617 729**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3F	Resealing	MTEF	1 205 675	882 850	848 215	629 525	613 000	672 650	719 736	770 118	824 026	881 708
		Desired Funding	224 140	191 574	141 277	65 632	9 405	1 204 031	1 239 912	997 711	1 067 551	1 142 279
		Additional funds required	**0**	**0**	**0**	**0**	**0**	**531 381**	**520 176**	**227 593**	**243 525**	**260 571**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3G	Light Rehabilitation	MTEF	0	0	0	0	0	0	0	0	0	0
		Desired Funding	1 281 928	1 324 508	1 291 846	1 415 475	1 251 159	567 422	552 542	382 548	409 326	437 979
		Additional funds required	**1 281 928**	**1 324 508**	**1 291 846**	**1 415 475**	**1 251 159**	**567 422**	**552 542**	**382 548**	**409 326**	**437 979**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3H	Bridge maintenance	MTEF	21 000	30 500	40 000	45 000	50 000	55 000	58 850	62 970	67 377	72 094
		Desired Funding	158 829	165 812	169 855	157 996	164 536	170 485	182 419	195 188	208 851	223 471
		Additional funds required	**137 829**	**135 312**	**129 855**	**112 996**	**114 536**	**115 485**	**123 569**	**132 219**	**141 474**	**151 377**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3I	Rehab & reconstruction of paved roads	MTEF	522 018	676 605	537 158	282 762	157 012	293 421	313 960	335 938	359 453	384 615
		Desired Funding	693 872	683 908	766 867	718 803	939 370	428 460	407 445	819 710	877 089	938 486
		Additional funds required	**171 854**	**7 303**	**229 709**	**436 041**	**782 358**	**135 039**	**93 484**	**483 772**	**517 636**	**553 871**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3J	Access & development projects (Community Based Public Works Programme)	MTEF	0	0	0	0	0	0	0	0	0	0
		Desired Funding	19 854	20 726	21 232	19 749	20 567	21 311	22 802	24 399	26 106	27 934
		Additional funds required	**19 854**	**20 726**	**21 232**	**19 749**	**20 567**	**21 311**	**22 802**	**24 399**	**26 106**	**27 934**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3K	Road safety improvements	MTEF	65 500	75500	80 000	50 000	55 000	60 000	64 200	68 694	73 503	78 648
		Desired Funding	39 707	41 453	42 464	39 499	41 134	42 621	45 605	48 797	52 213	55 868
		Additional funds required	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3L	Contributions: Cape Town MTAB	MTEF	0	0	0	0	0	0	0	0	0	0
		Desired Funding	19 854	20 726	21 232	19 749	20 567	21 311	22 802	24 399	26 106	27 934
		Additional funds required	**19 854**	**20 726**	**21 232**	**19 749**	**20 567**	**21 311**	**22 802**	**24 399**	**26 106**	**27 934**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3M	Contributions: Municipal rehab & reconstruction (Eqt share)	MTEF	27 650	7000	3000	21 000	22 000	23 000	24 610	26 333	28 176	30 148
		Desired Funding	19 854	20 726	21 232	19 749	20 567	21 311	22 802	24 399	26 106	27 934
		Additional funds required	**0**	**13 726**	**18 232**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3N	Total Construction of renewals & replacements	MTEF	1 978 993	1 816 695	1 658 338	1 215 747	1 092 347	1 307 671	1 399 208	1 497 154	1 601 954	1 714 091
		Desired Funding	2 164 038	2 095 994	2 072 370	1 744 706	2 293 878	2 697 441	2 643 555	2 907 251	3 110 759	3 328 512
		Additional funds required	**1 200 169**	**1 004 622**	**1 158 506**	**1 104 604**	**1 820 425**	**1 408 838**	**1 264 749**	**1 431 929**	**1 532 164**	**1 639 415**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3O	Gravel road upgrading	MTEF	154 500	164 200	144 000	168 000	226 000	246 000	263 220	281 645	301 361	322 456
		Desired Funding	713 315	512 069	548 932	611 781	796 437	422 202	712 066	800 215	727 177	778 079
		Additional funds required	**558 815**	**347 869**	**404 932**	**443 781**	**570 437**	**176 202**	**448 846**	**518 570**	**425 816**	**455 624**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3P	Paved road upgrading	MTEF	232 000	219 000	224 000	174 000	246 000	259 000	277 130	296 529	317 286	339 496
		Desired Funding	512 069	548 932	611 781	796 437	422 202	712 066	800 215	727 177	778 079	832 545
		Additional funds required	**280 069**	**329 932**	**387 781**	**622 437**	**176 202**	**453 066**	**523 085**	**430 648**	**460 793**	**493 049**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3Q	New facilities	MTEF	30 000	90 000	210 000	270 000	270 000	410 000	438 700	469 409	502 268	537 426
		Desired Funding	276 753	723 166	567 279	270 000	381 776	410 000	33 332	35 665	38 162	40 833
		Additional funds required	**246 753**	**633 166**	**357 279**	**0**	**111 776**	**0**	**0**	**0**	**0**	**0**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3R	Total upgrading and new facilities	MTEF	618 000	928 175	1 105 955	1 174 000	1 386 000	1 239 000	1 325 730	1 418 531	1 517 828	1 624 076
		Desired Funding	3 694 069	3 532 932	3 768 781	2 996 437	2 762 202	2 892 066	2 342 615	2 377 545	2 543 973	2 722 051
		Additional funds required	**3 076 069**	**2 604 757**	**2 662 826**	**1 822 437**	**1 376 202**	**1 653 066**	**1 016 885**	**959 014**	**1 026 145**	**1 097 975**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3S	Total Maintenance (Vote 10, Prog 3, Sub-prog 5)	MTEF	2 318 398	2 043 890	2 088 260	1 957 157	2 005 144	2 134 057	2 283 441	2 443 283	2 614 312	2 797 314
		Desired Funding	3 976 403	4 014 725	3 906 651	3 659 264	3 873 965	4 150 559	4 194 799	3 974 666	4 252 893	4 550 595
		Additional funds required	**2 639 540**	**2 662 111**	**2 525 329**	**2 266 000**	**2 472 416**	**2 016 502**	**1 911 357**	**1 531 383**	**1 638 580**	**1 753 281**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3T	Total Construction (Vote 10, Prog 3, Sub-prog 4)	MTEF	1 205 518	1 680 280	1 723 113	1 506 762	1 598 012	1 592 421	1 703 890	1 823 163	1 950 784	2 087 339
		Desired Funding	4 447 502	4 279 019	4 599 344	3 774 489	3 763 273	3 384 457	2 818 467	3 270 450	3 499 382	3 744 338
		Additional funds required	**3 267 777**	**2 632 787**	**2 913 767**	**2 278 228**	**2 179 127**	**1 809 415**	**1 133 172**	**1 467 184**	**1 569 887**	**1 679 779**

			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-3U	Total (Vote 10, Prog 3)	MTEF	3 970 732	4 145 292	4 246 385	3 949 899	4 113 398	4 262 125	4 560 474	4 879 708	5 221 287	5 586 778
		Desired Funding	8 891 059	8 758 178	8 989 329	7 947 711	8 176 756	8 101 137	7 619 015	7 893 268	8 445 797	9 037 003
		Additional funds required	**5 935 450**	**5 338 210**	**5 487 419**	**4 573 457**	**4 682 252**	**3 858 080**	**3 078 944**	**3 035 391**	**3 247 869**	**3 475 220**

Table 7-4: Cash flow forecasts and desired funding estimates for overload control

Average MTEF inflation increase*	7%		All monetary values are in currency of the year shown

			Current MTEF Period									
			2022/23 (x R1000)	2023/24 (x R1000)	2024/25 (xR1000)	2025/26 (xR1000)	2026/27 (xR1000)	2027/28 (xR1000)	2028/29 (xR1000)	2029/30 (xR1000)	2030/31 (xR1000)	2031/32 (xR1000)
Table 7-4A	Routine maintenance	MTEF	0	0	0	0	0	0	0	0	0	0
		Desired funding	2 732	2 923	3 128	3 347	3 581	3 832	4 100	4 387	4 694	5 023
		Additional funds required	**2 732**	**2 923**	**3 128**	**3 347**	**3 581**	**3 832**	**4 100**	**4 387**	**4 694**	**5 023**
Table 7-4B	Renewals and replacements	MTEF	0	0	0	0	0	0	0	0	0	0
		Desired funding	1 018	1 089	1 166	1 247	1 334	1 427	1 527	1 634	1 748	1 870
		Additional funds required	**1 018**	**1 089**	**1 166**	**1 247**	**1 334**	**1 427**	**1 527**	**1 634**	**1 748**	**1 870**
Table 7-4C	Upgrading and new facilities	MTEF	0	0	0	0	0	0	0	0	0	0
		Desired funding	698	747	799	855	915	979	1 048	1 121	1 199	1 283
		Additional funds required	**698**	**747**	**799**	**855**	**915**	**979**	**1 048**	**1 121**	**1 199**	**1 283**
Table 7-4D	Operational Expenditure	MTEF	32 395	32 458	33 915	35 611	37 391	39 261	42 009	44 950	48 096	51 463
		Desired funding	49 375	51 946	54 653	57 932	61 408	65 707	70 306	75 227	80 493	86 128
		Additional funds required	**16 980**	**19 488**	**20 738**	**22 321**	**24 017**	**26 446**	**28 297**	**30 277**	**32 397**	**34 665**
Table 7-4E	Total Overload Control (Vote 10, Sub-prog 5.4	MTEF	32 395	32 458	33 915	35 611	37 391	39 261	42 009	44 950	48 096	51 463
		Desired funding	53 823	56 705	59 746	63 381	67 238	71 945	76 981	82 369	88 134	94 304
		Additional funds required	**21 428**	**24 247**	**25 831**	**27 770**	**29 847**	**32 684**	**34 972**	**37 419**	**40 038**	**42 841**

7.3.1 Expenditure trends

Expenditure trends between the 2016/17 and 2020/21 financial year are shown in Figure 7-1 for the different types of expenditure. No easily observable trends are apparent. However, there was a considerable increase in rehabilitation expenditure in 2018/19 and a large increase in upgrading to surfaced roads in 2017/18.

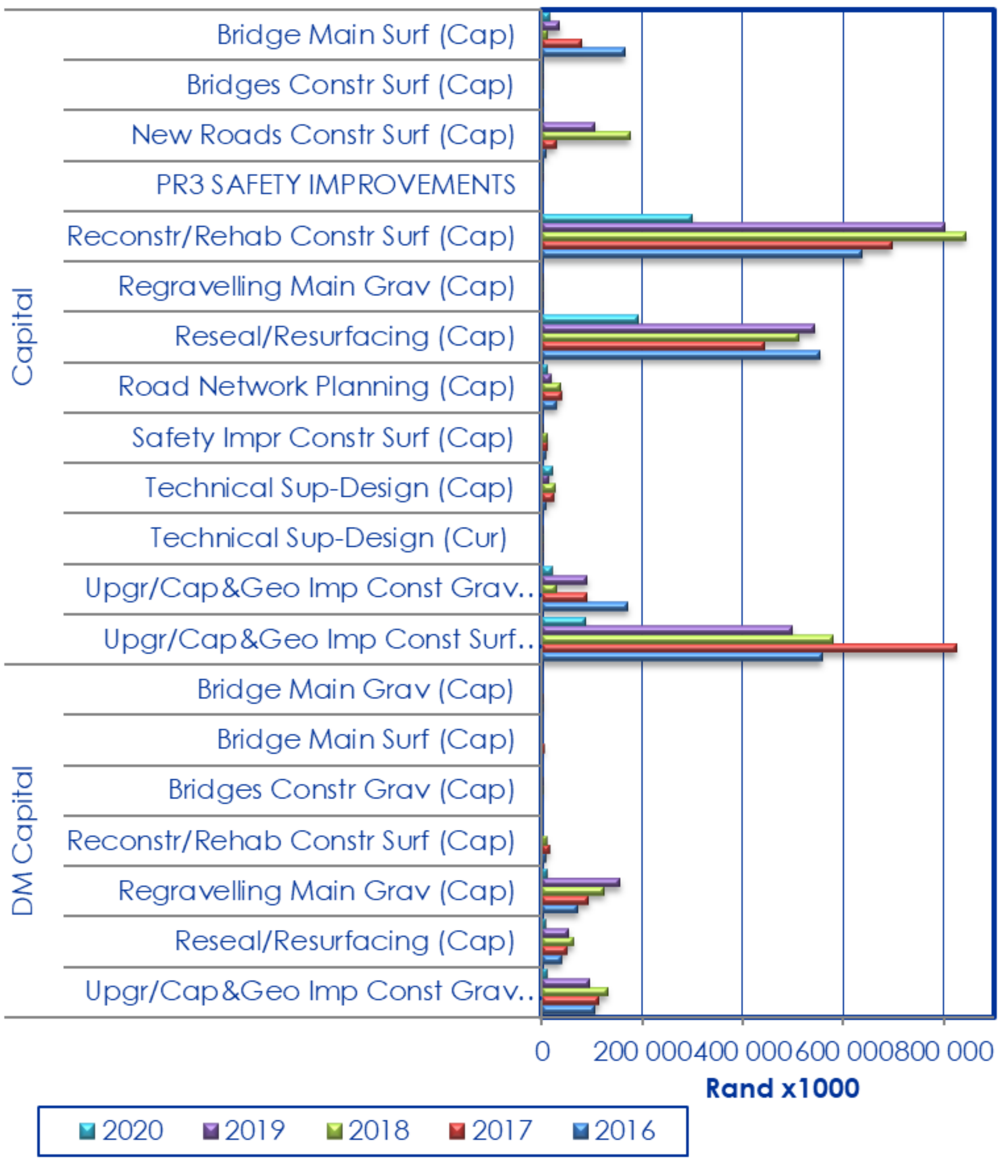


Figure 7-1: Capital and current expenditure for 2016/17 to 2020/21

7.4 Funding strategy

The details of the financial resources required are shown in Table 7-3 and Table 7-4. These summaries of the financial resources show the amounts required for road infrastructure and overload control infrastructure, respectively.

From Table 7-1 it follows that considerable additional funding for roads will have to be provided to realise the required LOS.

From Table 7-4 it can be seen that additional funding for overloading control will have to be provided to realise the required LOS in overloading control.

Although the Department generates revenue of about R1 860 million per annum (as indicated in Vote 10: Transport and Public Works published in 2021), mainly from vehicle licensing fees, these funds are paid over to Provincial Treasury for reallocation, and not utilised directly by the Branch. The scope for increasing these revenues beyond the annual inflation rate adjustments is severely limited. The licence fees of the Western Cape are already some of the highest in South Africa and complaints about these fees are received regularly. The only way the additional funding required could be obtained would be by means of additional grants from Provincial Treasury.

7.4.1 Proposals to supplement funding

The Branch is considering various alternate funding strategies, pending the enactment of the Western Cape Transport Infrastructure Bill. It should be noted that bringing any one of these funding strategies to fruition would require a rigorous legislative, planning and public participation process that will probably require many years to implement.

The following proposals may be considered to supplement the shortfall in funding:

- Introduction of a provincial fuel levy, km-charges, weight-distance and private/public partnership initiatives;
- The PRMG incentive and EPWP incentive grants based respectively on the year-on-year performance of the Strategic Network and job creation levels, have promise for increased funding levels, with its compulsory reporting conditions and various additional requirements such as safety assessments and condition assessment audits;
- Negotiation for a more equitable share from the nationally generated fuel levy;
- Increases in, and the standardisation of, provincial and national vehicle licensing fees;
- Increased fees for planning and way leave applications;
- Implementation of a development levy as the developer's contribution to specific infrastructure improvements concurrent with development impacts; and to "air-rights" in cases where developments overhang road reserves;
- Charging a levy on freight that should ideally be transported by rail;
- Introduction of a tax on owners in possession of undeveloped land in rural areas;
- Sharing accident environmental damage claims responsibly between road agencies and insurance companies;
- Increasing fines for overloading;
- Introducing a levy for the transportation of hazardous materials;
- Introducing provincial tolling;
- Development loans and private-public funding initiatives;
- Introducing tourism taxes on, inter alia, beds, airports and harbours; and

- Introducing a distance penalty for heavy vehicles as these users have a major detrimental impact on the road pavement.

The funding strategy thus relies on additional allocations to the Branch by Provincial Treasury.

7.4.2 Alternative method of funding investigated

The DTPW receives around R 3.5 billion, which is mainly composed of the Provincial Road Maintenance Grant (approx. R 1 billion), and the Equitable Share (R 2.5 billion). The backlog on technical needs exceeds R 26 billion rands, which amounts to an annual shortfall of over R 3,2 billion over a 10-year intervention. Thus, based on available funding and resource optimisation, the DTPW spend is mainly focused on preventative maintenance and rehabilitation of ageing infrastructure.

Based on this preservation approach, the Branch have applied to National Treasury, to request for funding on large infrastructure projects within the Western Cape for the 2020/21 MTEF cycle, in accordance with the Budget Facility for Infrastructure guidelines National Custodian Department.

Funding was requested for the following mega projects:

- The N7 Northern Growth Corridor: BFI 1923
- The Wingfield Southern Growth Corridor: BFI 1924

National Treasury have responded to the Branch's funding request on 14 July 2020, and the Joint Technical Committee (JTC) have not recommended BFI 1923 for further technical analysis, based on gaps identified in the submission. BFI 1924 has been recommended for further technical analysis and the Branch have been in further discussions with the JTC and National Treasury for funding approval.

The implementation of these two projects will integrate with Cape Town Freeway Integrator, which is focused on economic growth, development opportunity, land unlocking and job creation across the Cape Town Metropolitan Municipality. More detail on the application is available in a document entitled "Western Cape Government Department of Transport and Public Works, Road and Transport Management Branch - The Cape Town Freeway Integrator" (available on request).

In addition to the above, the Department have applied to Infrastructure South Africa (ISA) within the 2021/22 financial year, to request for funding for the Cape Town Freeway Integrator. Extensive engagements have taken place with ISA to secure funding for the future financial years for the project.

.

Chapter 8 – Organisational and support plan structure

8.1 Introduction

Implementing an asset management approach is a change that leads organisations to question traditional ways of thinking and working. This can include reviews of organisational structures, roles and responsibilities, and contractual relationships. This can make the introduction of asset management thinking and practices a challenging experience for people, be it senior management roles, staff delivering asset management activities, or working in the supply chain. Effective leadership is therefore crucial for building an organisation with an appropriate culture which supports the delivery of good asset management (Institute of Asset Management, 2015b).

The subjects of organisation and people are highly interdependent and exert strong influences on an organisation's ability to adopt and embed asset management successfully. It is necessary to invest time and effort in them to produce the performance and behaviours that will support successful delivery of the asset management strategy and objectives. They are important for delivering the level of business integration that characterises more mature asset management capability (Institute of Asset Management, 2015b).

Organisation and people enablers are listed in Table 8-1 below (Institute of Asset Management, 2015b). Each enabler should be assessed and the gap determined before implementation of a plan to address shortcomings. Each enabler is discussed in more in the paragraphs that follow.

Table 8-1: Organisation and people enablers

Organisation and people enablers	Description of the enabler
Procurement and supply chain management	The processes used by an organisation to ensure that all outsourced asset management activities are aligned with the asset management objectives of the organisation and to monitor these activities against these objectives
Asset management leadership	The leadership of an organisation required to promote a whole life asset management approach to deliver the organisational and asset management objectives of the organisation
Organisational structure	The structure of an organisation in terms of its ability to deliver the organisational and asset management objectives
Organisational culture	The culture of an organisation in terms of its ability to deliver the organisational and asset management objectives
Competence management	The processes used by an organisation to systematically develop and maintain an adequate supply of competent and motivated people to fulfil its asset management objectives including arrangements by managing competence in the boardroom and the workplace

8.2 Procurement and supply chain management

Research has indicated that organisations benefit from using their supply chains strategically and encouraging their key suppliers to participate in their whole-life value approach. Organisations with more mature asset management cultures fully align their asset management objectives and strategy and the resourcing strategy is then developed from this. The most mature organisations approach managing their supply chains as they would any other critical asset.

Procurement and supply chain management are managed in the Department, but outside the Branch. The current good relationship between the Branch and the Chief Directorate: Supply Chain Management enables the alignment of procurement and supply chain management with the Branch's asset management objectives and strategy.

8.3 Asset management leadership

Asset management leadership is crucial in an organisation aspiring to deliver effective asset management. This leadership sets the direction and priorities for the development of the asset management capabilities necessary to deliver on the organisation's overall objectives. Leaders set direction, challenge the status quo, innovate and drive the definition, development and implementation of improved procedures and systems. All leaders must excel in the following (Institute of Asset Management, 2015b):

- Give direction to of the organisation. In the context of asset management this means that leaders must promote a whole life approach to asset management so that society can realise maximum value from its assets, consistent with business risk and performance;
- Articulate their vision clearly and communicate it in a persuasive and practical way, using a variety of approaches, while being simultaneously demanding and supportive;
- Make "difficult" decisions in the face of ambiguity, where difficult decisions may be simple or complex;
- Inspire staff to contribute to achieving the organisation's goals; and
- Provide stakeholders with confidence about the direction being taken and the benefits that will be achieved.

The degree to which the current and future leadership of the Branch excels at these practices will determine how successful the Branch will be in practising good asset management and achieving its asset management objectives.

8.4 Organisational structure

8.4.1 Historic structures

The macro structure of the Transport Infrastructure Branch responsible for roads have changed multiple times in the past, with the timeline stretching back to when the Branch was a full Department. The most recent macro structure that was in place from 2012 to March 2020 is shown in Figure 8-1.

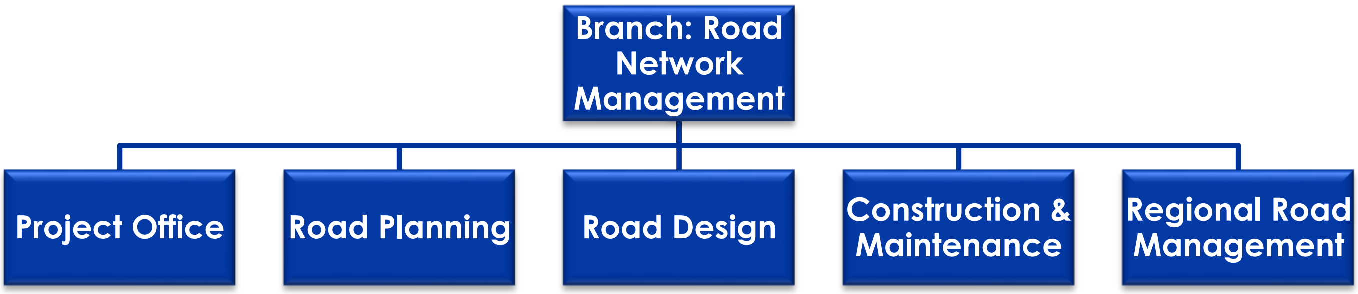


Figure 8-1: Macro-organogram of the branch until 31 March 2020

8.4.2 Aligning organisational structure

In the last few years, the Branch have worked towards aligning the organisational structure with asset management objectives, as this is a key factor in determining an appropriate structure. The revision to this historic structure to meet the requirements of the Branch in terms of its organisational and asset management objectives has been thoroughly pursued during the last few years. This includes the determination of a suitable structure and adequate numbers of posts on appropriate levels. In order to achieve this, many authoritative documents were consulted, some of which are listed below:

- SANS 55001:2015 - Asset Management (International Standards Organization for Standardization, 2015);
- Asset Management – an anatomy (Institute of Asset Management, 2015b);

- The Asset Management Landscape (Global Forum on Maintenance and Asset Management, 2014);
- Organisation and people (Institute of Asset Management, 2015d);
- Asset Management – whole-life management of physical assets (Lloyd, 2010); and
- Draft Guide to the Road System Manager for the Western Cape (Henderson, 2015).

The IAM concept for an organisation implementing best practice in asset management is the basis on which the new structure is based is shown in Figure 8-2.

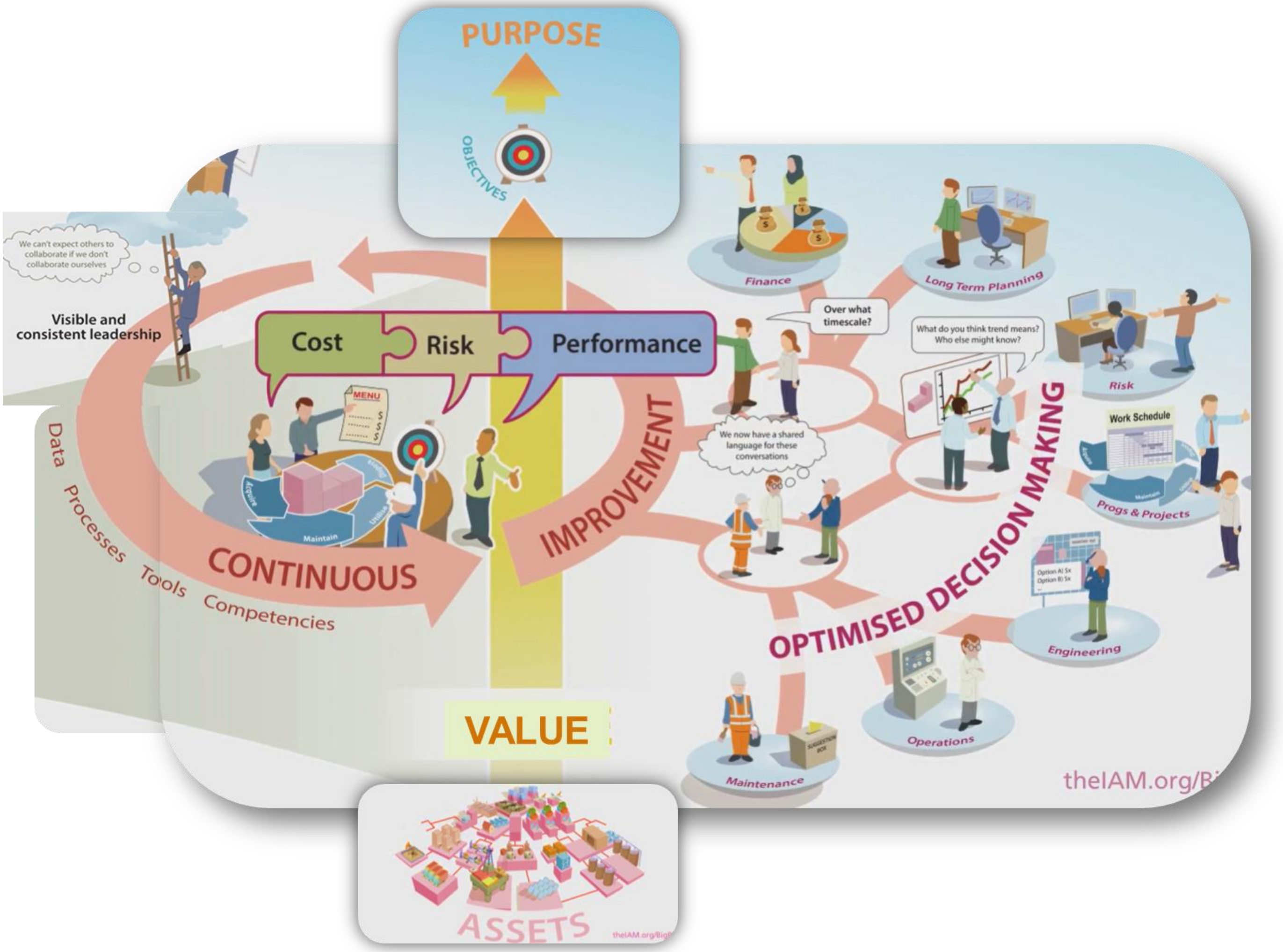


Figure 8-2: IAM concept for an organisation whose business is asset management

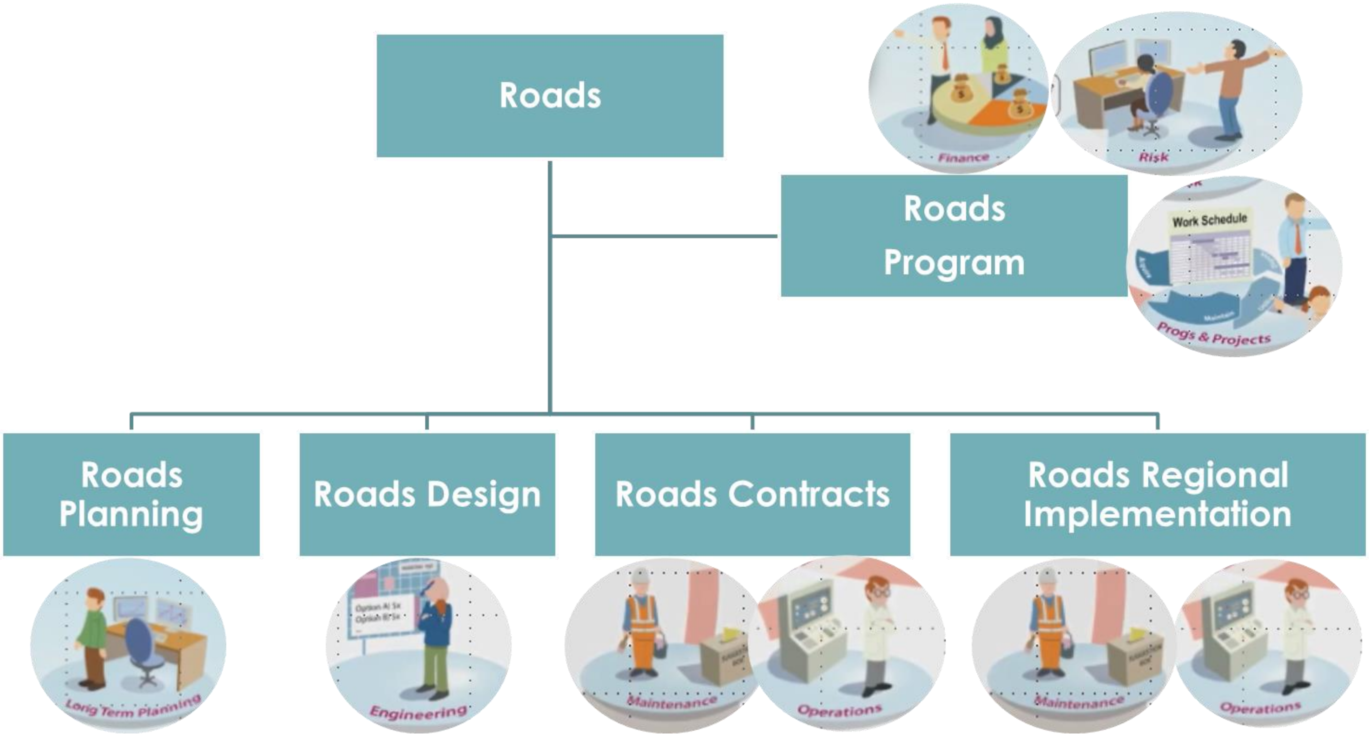
8.4.3 Triggers for change

There is no single organisational structure and culture that applies to all organisations, or is best suited to good asset management (Institute of Asset Management, 2015d). It follows that the Branch needed to understand the historic structure and decide what needed to change for it to successfully meet its objectives. The major triggers for change are as follows:

- A high risk that the management and delivery of projects and programmes will not achieve the desired outcomes with the current structure and staffing. The current structure lacks a component that has accountability for the coordination and management of the portfolio of assets, programmes and projects from inception to final completion.

- Whether the Branch is structured to promote integrated asset management rather than silos. The current structure does not support integrated asset management very well, resulting in a culture of working in silos.
- The need to implement new business processes that support asset management. The IAM concept organisation, presented in Figure 8-2, puts the whole organisation together in a "big picture".

The concepts represented in the "big picture" organisation have been translated into a structure that will help facilitate asset management in the Branch. An organogram illustrating how the newly implemented structure relates to the "big picture" organisation is shown in Figure 8-3.



Copyright IAM - clipart is an extract from the IAM Big Picture

Figure 8-3: High level organogram to facilitate asset management

8.4.4 Factors influencing the design of the structure

Integrated asset management

The key requirement of the newly implemented structure is to promote integrated asset management, as opposed to silos.

Line of sight

The new implemented structure connects a clear line of sight from top management to staff working on the ground from policy and strategy, to operational plans, to work execution. This can ensure that the Branch's activities are aligned to the top level objectives with the cultural goal of understanding how everybody contributes to achieving success. Organisational structure is a key enabler of line of sight and should facilitate effective communications and feedback in all directions with internal and external staff and stakeholders. Asset management-related roles should have clear profiles or job descriptions identifying the contributions they make to the delivery of asset management objectives and how their work affects others (Institute of Asset Management, 2015d).

The value chain

The asset management value chain is a chain of activities that take place within organisational components (Porter, 2008). Products pass through all activities of the chain, in order, and in each activity the product gains some value. The chain of activities gives the product more added value than the sum of the added values of all the activities. Each of the Branch's components has a role in adding value to the products and the activities should be grouped logically together to facilitate value creation. It is the process of integrating these activities in the Branch's components that truly creates the value chain. All these activities are built on a foundation of programme management that facilitate asset management and programme management as shown in Figure 8-4.

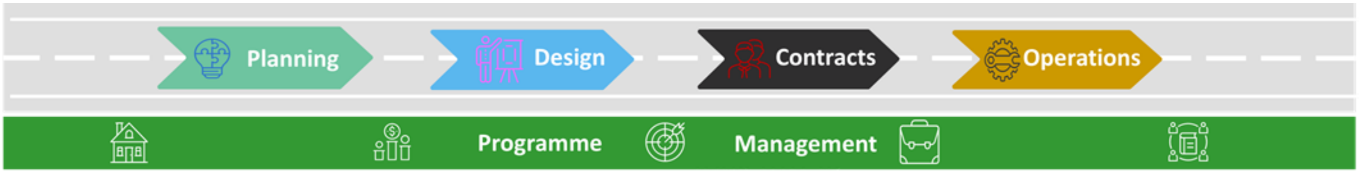


Figure 8-4: High level organogram flow to facilitate value asset management

Decision making on strategic, tactical and operational levels

There is a need to group functions logically with respect to their level and impact on decision making in terms of asset management (Figure 8-5). There is a need to split functions that span strategic to operational level decision making.

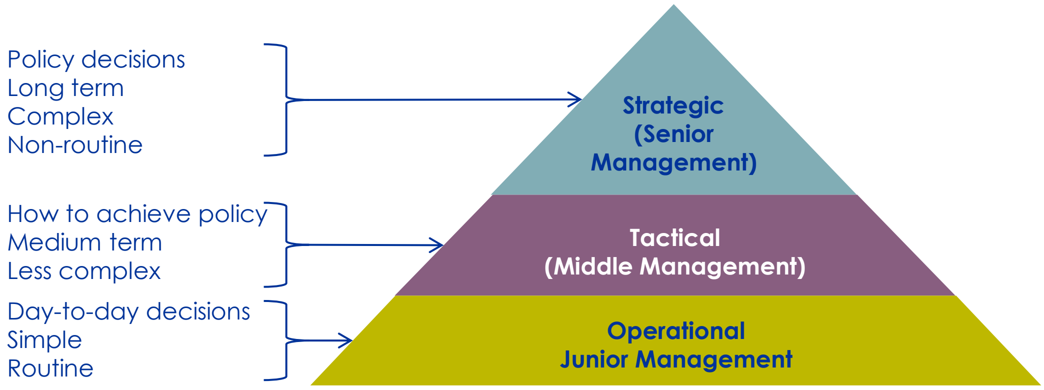


Figure 8-5: Decision making at different levels

Sustainability and continuity

There is an imperative to maintain sustainability and continuity in the Branch. A high risk of losing sustainability and continuity is neither economically nor politically acceptable as the consequences for the Western Cape road network and economy are very negative in the mid- and long-term.

The structure should facilitate the establishment of a "**critical mass**" of professional and technical people in their disciplines and asset management, especially for those disciplines that are in demand and supply is limited. For the Branch, this means all types of civil engineers and many technologists. A critical mass of professional and technical people will assist in building and retaining institutional memory for sustainability in terms of asset management. Staffing of the proposed structure is based on minimum operational requirements due to current economic conditions and the filling all positions is therefore critical. This applies especially to middle management and lower management staff in order to retain continuity, both for short term absences of top and middle management, and for long-term succession planning for top management.

The role of teams

Multi-disciplinary asset management teams are essential for unifying asset management activities across the Branch and driving progress across boundaries. They provide a way of overcoming fragmented thinking and attitudes and developing holistic approaches, decision making and practices. The effect of asset management can be seen as a wider shift into a new mode of knowledge production which is replacing or reforming established institutions, disciplines, practices and policies (Lloyd, 2010)(pp138-157).

8.4.5 New organisational structure

The new organisational structure, with the macro structure shown in Figure 8-6 was approved by the Executive Authority and implementation has commenced. Matching and placing was completed.

Figure 8-6: New organisational structure for the roads branch

The new organisational structure, with the microstructure is provided in Appendix Q.

8.4.6 Outsourcing and agreements with local authorities

Due to the current economic conditions and reasons of cost-effectiveness, the specialised and cyclical nature of work undertaken by the Branch will continue to operate on a co-sourced resource model in which internal capacity is augmented with contracted expertise from consulting engineers, contractors and district municipalities.

8.5 Branch culture

One of the most important elements of asset management is the role of culture. It is the foundation of good asset management, and a key ingredient of its success (Institute of Asset Management, 2015b). Culture refers to a long-lived set of values, beliefs, attitudes and assumptions which affect behaviour and performance over the longer term (Institute of Asset Management, 2015d). A simple definition is: "*the way things are done around here*".

Building an organisation with a healthy culture is a significant part of effective leadership and the organisational structure can have a major influence on the culture of the organisation and vice versa.

Creating an appropriate culture is integral to achieving the level of integration between functions that good asset management requires (Institute of Asset Management, 2015b).

To enhance the culture and the connection between staff and the end vision, the Department have embarked on a campaign for "Shaping the future, Better together". Figure 8-7 shows some of the campaign themes developed by the DTPW, focused on roads.

The approach is focused on creating a unifying rally cry that will work across all level of the Department in order to galvanise it with shared, single minded aspiration that will help motivate the Department's personnel. No matter the role, function or skill set, each and every person connected to the DTPW plays a critical role in making the Western Cape a state-of-the-art and well function place for all to live and work, and the Roads Branch is no different.

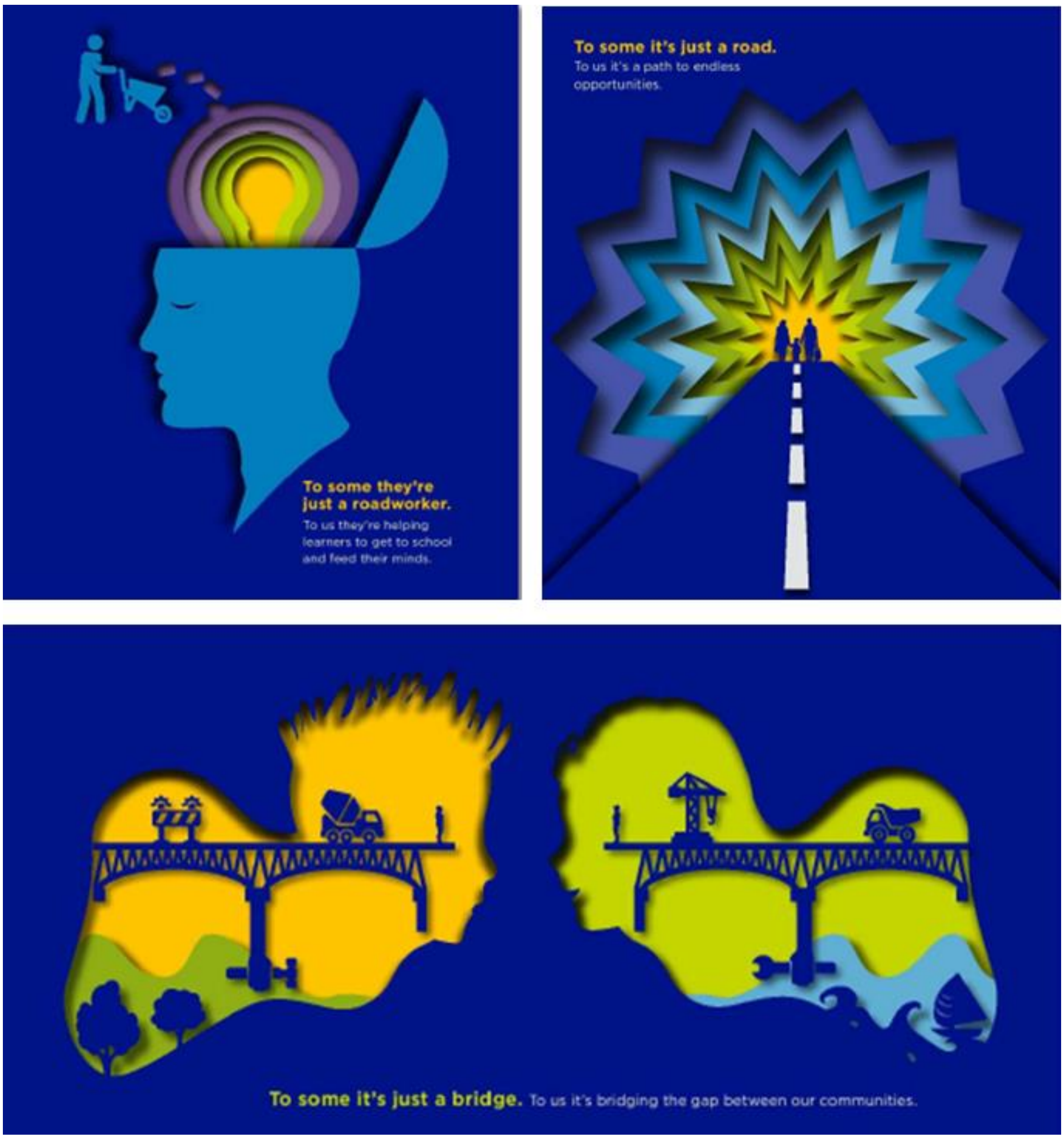


Figure 8-7: Shaping the future, better together campaign focused on roads

This approach has been complemented with a full roll out plan and the establishment of a new manifest for the Department, as shown in Figure 8-8. It is noted how the road staff is thread through the Branch, from engineers, maintenance workers and road workers.

MANIFESTO

As a department we **honour our obligation** to serve all the people of this province, no matter who they are.

Because to us, a bricklayer doesn't just lay bricks, they **shape** the foundations for schools and hospitals.
A healthcare facility doesn't only help people who are sick, it helps **shape** healthy and fit communities by restoring their dignity and prosperity.
And a road worker doesn't just build roads, they **shape** pathways that lead to endless **opportunity.**

Together, let's **connect, recycle, renew, sustain** and **prosper**
And when you see our state-of-the-art health facilities,
brand new schools, **greener technology**, **efficient**, **safer** roads and transport systems, remember that they are there because of you.

And no matter if you are an engineer, an architect, a cleaner, an accountant, a maintenance worker, or a traffic officer, you're helping to **redress the past** and take our province into the **future.**

Through **mutual respect** and **ethical behaviour** we can and will shape our province into a **dignified society**, one which we can all be **proud** of.

The Department of Transport and Public Works.
Shaping the future. BETTER Together.

Western Cape Government

Figure 8-8: New manifesto for the department's campaign

8.6 Competence management

Competence management is *"The processes used by an organisation to systematically develop and maintain an adequate supply of competent and motivated people to fulfil its asset management objectives including arrangements by managing competence in the boardroom and the workplace"* (Institute of Asset Management, 2015d).

People "do" asset management and therefore people, and their knowledge, competence, motivation and teamwork can make the biggest difference to good or poor asset management, otherwise known as an "asset management culture".

It is inevitable that people coming to the discipline of asset management have already demonstrated competence in other professions, such as engineering or finance, and may have significant specialist expertise in a field such as maintenance or auditing. Determining what competences are needed to complete the development of an individual is important, and can be acquired through the following avenues:

- asset management training courses developed by various organisations, including free e-learning courses;
- publications and on-line resources, some of which are available from the IAM;
- asset management conferences; and

- working on projects/ initiatives which will enable development of asset management knowledge in specific areas (Institute of Asset Management, 2015b).

The Branch continue to support their staff by Membership to the Institute of Asset Management and are currently in process to also register at The Southern African Asset Management Association (SAAMA), that aims to promote the interests of asset management and maintenance, as well as to uplift the role of asset management and maintenance practitioners in Southern Africa, to enhance our international perspective with a regional view.

8.6.1 39 subjects defining asset management

The 39 subjects describe the body of asset management knowledge as a whole, The 39 subjects are aligned with the Asset Management Landscape version 2 (Global Forum on Maintenance and Asset Management, 2014), published by the Global Forum on Maintenance and Asset Management (GMFAM), which was developed by the global asset management community to define the scope of the discipline.

The 39 asset management subjects (Figure 8-9) are linked to 6 subject groups, which in turn are reflected in the conceptual model (Figure 8-9) in a structured way.

These 39 subjects are intended to describe the complete scope of asset management. Therefore, any person who intends to become demonstrably competent or expert in this field will need to know enough of the complete breadth of all the subjects in addition to any deep and detailed expert knowledge in any one of them. Although the 39 subjects are described individually, they should be not considered as discrete subjects. There is interrelationship between the subjects and the contribution they make as a whole to an organisation's asset management capabilities (Institute of Asset Management, 2015b).

8.6.2 Competences Framework

The IAM has developed a competences framework that describes what people working in asset management should be able to do and indicates what they ought to know and understand. It is a tool that organisations, managers and individuals can use in numerous ways including in training needs analysis, recruitment and selection, career planning, continuing professional development and workforce management.

The framework contains a single set of generic competence requirements that are applicable to all organisations and sectors where business performance relies on optimising the delivery and performance of physical assets. The framework describes what people involved in the management of physical assets should be able to do and the knowledge and understanding needed to underpin this. Its structure is compatible with that of other leading competence frameworks and its contents reflect the principles and support the requirements of BSI PAS 55:2008 (British Standards Institute 2008), the precursor to ISO55000 (International Standards Organisation 2014). The Framework consists of two documents:

- Part 1 sets out asset management competence requirements and
- Part 2 contains guidance on how to use the framework.

The framework defines a key purpose for people working in asset management and the 6 roles needed to achieve this. Each role is broken down into a small number of competence units, such as "Develop the Asset Management Policy". There are 27 units in total. Each unit is then subdivided into a small set of elements of competence such as "Assess policy options using appropriate decision criteria".

To adapt the competences framework to the Branch's specific needs, a decision on which of the units are applicable to various roles within the Branch would need to be taken. In addition, the development of performance criteria is needed for each element and the knowledge and understanding requirements will also need to be tailored to the Branch's circumstances.

Figure 8-9: 6 subject groups and 39 subjects

Using the Competences Framework

The Competencies Framework assists with:

- Writing or reviewing job descriptions;
- Planning recruitment;
- Defining selection criteria;
- Identifying individual learning and development needs;
- Managing individual and team performance;
- Career planning; and
- Performance review.

Part 2 of the framework contains guidance on how the Framework can be used to combine these and other processes in a systematic approach to managing the competence of the asset management workforce in the Branch. A copy of the Framework has been obtained from the IAM and can provide a valuable resource for the Branch for managing the competence of its staff.

8.6.3 Gap analysis of asset management competences

A gap analysis of the asset management competences of current Branch staff in the subset of subjects relevant to the Branch has not yet been done. Very few of these subjects are covered at under-graduate level in civil engineering. Most subjects will require additional study to fill the gap between the current knowledge of and expertise in the relevant subjects listed in Figure 8-9 and the level required to be competent practitioners of asset management.

8.7 Human resources

8.7.1 Current status

The newly approved posts within the new structure will not be filled at once, and as of 21 March 2022 the status of the establishment is as shown in Figure 8-10 and Figure 8-11.

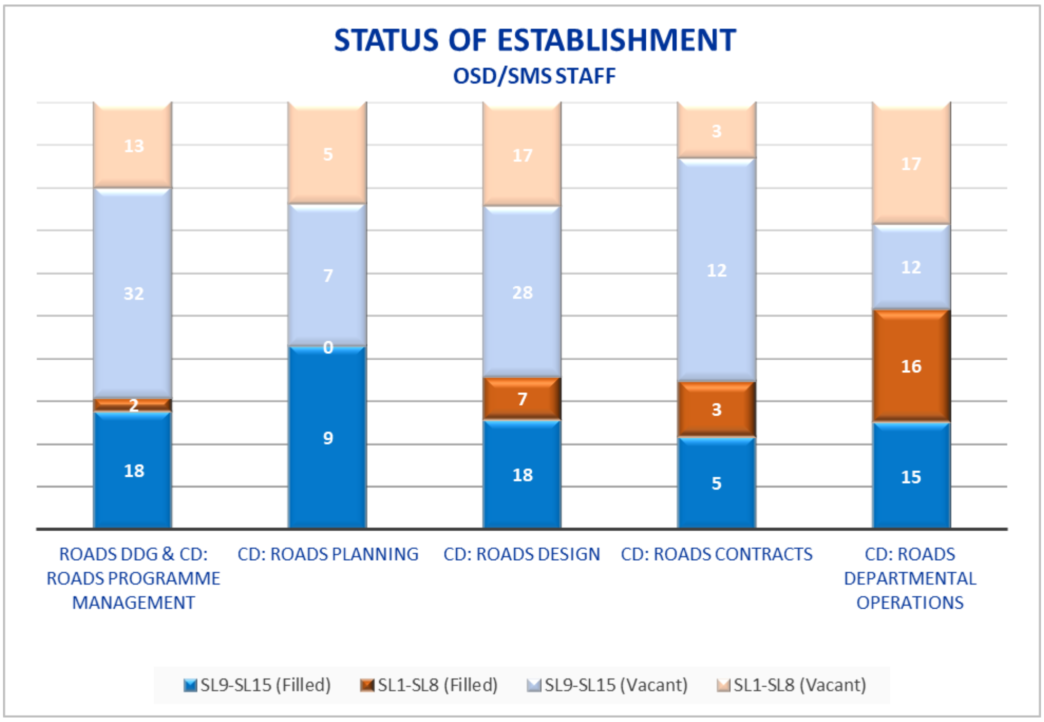


Figure 8-10: Branch establishment status for OSD and SMS Staff

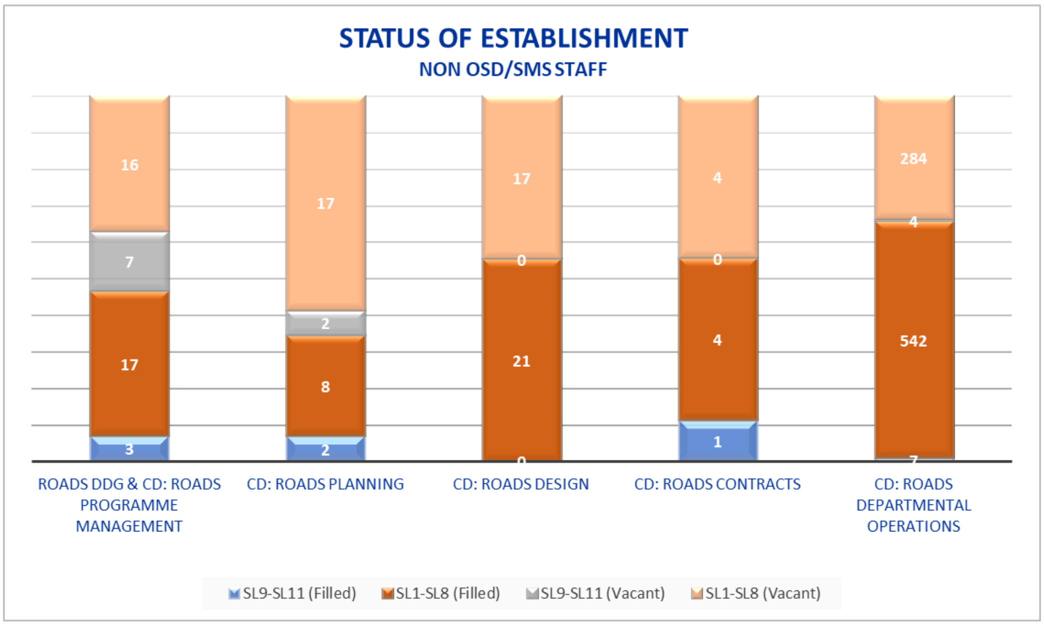


Figure 8-11: Branch establishment status for Non OSD and SMS Staff

There is a significant vacancy rate across Senior Management, Middle Management Professional Engineers, Technical Professionals, GISc staff, Environmentalist, Artisan positions and Road workers. The new vacant posts were recently frozen in the Western Cape and this have also already had an impact in the process of filling the above posts. The current Occupation Specific staffing status within the New Branch per post is summarised Table 8-2.

Table 8-2: Current personnel within the branch as filled at 21 March 2022 against the approved structure

Sub-Programme	Positions / Services		Training in Various Fields		
	Filled	Vacant	In Training	Year started monitoring	Successful**
Artisans	14	26	23	2021	7
Environmental staff	1	5	-	-	-
GISc	2	6	1	2021	1
Technicians	22	71	11	2010	9
Technologist	8	50	5		
Engineers	37	64	24		29
Professional Management staff (SMS)	4	9	3	2021	-

*** All staff that have been on the program at some stage are tracked, as far as possible to establish if the program had a long-term effect in having them professionally registered even if they have moved to industry at time of registration. Or only started with the branch as a Mature candidate.*

The shortage of staff, in production levels continues to make it difficult for this Branch to undertake its tasks and to attain employment equity targets. In 2005, the Branch developed a comprehensive recruitment and training program for engineers, and technicians that facilitate the registration of professionals that have assisted in filing of professional posts, which was a major challenge that has transpired in previous years. More on the success of this program in Chapter 10.

As good as this training program has proven to be, filling the age gap with people who have more than 10 years' experience in production engineering can only be achieved by external recruitment. The new Branch continues with the work that was identified as crucial to ensure a sustainable feed of technical staff.

Figure 8-12 shows the age profile for Engineers, and Artisans. The very low numbers of staff, or even no staff, that are between 40-60, is clearly illustrated. The current situation, causing focus to train younger staff to limit the vacuum at management level when current senior staff retire. Several people have been employed on 1-year contracts or multi-year contracts, to assist with the knowledge transfer. This is a huge risk for the Branch as staff recruitment is proven to be exceptionally difficult, in the age-gap (see Chapter 11 for further discussion on this topic).

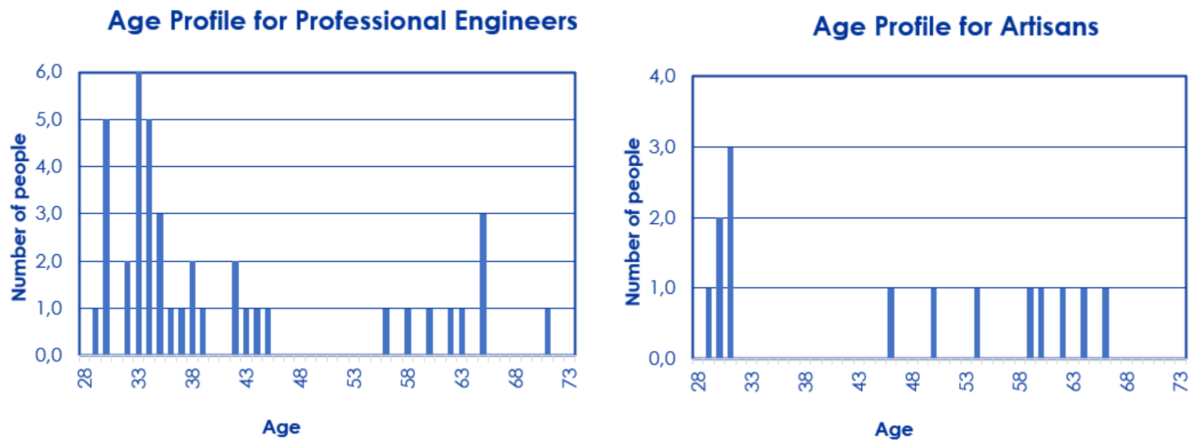


Figure 8-12: Age profile of engineering staff including management

8.7.2 Public Service framework for the employment of professional staff

The following Public Service documents were referred to in connection with this paragraph and paragraphs 8.7.3, 8.7.4 and 8.7.5:

- Department of Public Service and Administration Circular 5 of 2009: Implementation of the Occupational Specific Dispensation (OSD) for engineers and related occupations;
- GPSSBC [General Public Service Sector Bargaining Council] Resolution no. 5 of 2009: Agreement on the implementation of Occupational Specific Dispensation (OSD) for Engineering Technicians, etc.;
- GPSSBC Resolution no. 9 of 2009: Agreement on the implementation of an occupational dispensation for Engineers;
- Department of Public Service and Administration letter dated 11/3/2013: "Interpretation of GPSSBC Resolutions 3, 4, 5, 6, 8 and 9 of 2009 read together with the determination under DPSA Circular 5 of 2009: Occupational Specific Dispensation (OSD) for engineers and related occupations";
- Department of Public Service and Administration Public Service Regulations 2016; and
- Department of Public Service and Administration Directive on Compulsory Capacity Development, Mandatory Training Days and Minimum entry requirements for SMS dated April 2016.

8.7.3 Constraints on the employment of professional staff

A constraint is something imposed on the Branch that restricts the options it can consider. Constraints on the employment of engineers, technologists and technicians are described below.

- The limited pool of available competent engineers, technologists, and technicians with experience in the planning, design and delivery of road projects and programmes. This situation has been documented by Allyson Lawless (Lawless, 2005).
- The recruitment process for new staff is extremely long, taking many months, even up to a year, by which time candidates may no longer be available or interested in taking up positions in the Branch.
- The Occupational Specific Dispensation for Engineers and Related Professions and Occupations (OSD) notch progression of 2 years is a constraint on competitive salaries for highly competent professionals.
- The Occupational Specific Dispensation for Engineers and Related Professions and Occupations (OSD) does not include the management stream envisaged in 2009. Even though all Senior Management of the Roads Branch needs to be Professionally registered with ECSA, causing disparities between positions.
- The reluctance of many professional engineers and technologists and technicians to work for a provincial government as a result of the track record of under-performance in many provincial departments in South Africa, including those responsible for roads, as well as a culture that can be incompatible with professional values. Although these two factors are not perceived to be major issues in the Western Cape, many competent engineers, technologists and technicians, might well view employment in a provincial government roads department to be a less attractive career.; and
- The lack of annual salary increases and performance bonuses in the foreseeable future.

8.7.4 Barriers preventing employment of professional staff

A barrier is something that exists in the Branch that will prevent change occurring. Barriers preventing employment of engineers in the Branch are described below.

- As professional registration is not a requirement for many potential candidates working currently in the private sector, many experienced engineers cannot be offered a competitive salary in the Branch. Consequently, there is a very limited pool of engineers to which the Branch can offer competitive salaries. This is exacerbated by the interpretation of recruitment and selection that the new DPSA Regulations do not allow matching a salary of a person being recruited from the private sector in a Chief Engineer or Control Post. Also, the OSD does not take into account pre-registration experience for engineers at production level. These barriers, in conjunction with the constraint on the number of suitable candidates, creates a significant risk that no potential candidates will be employed.

Barriers preventing employment of artisans in the Branch are described below.

- As Artisans at the Roads Branch has to maintain the equipment of the Mechanical Services, which includes multiple specialised equipment. The OSD does not take into account the nature and value linked to this specialised equipment and the advance technical skill needed to maintain the equipment causing the only advancement or promotion to be in the management environment. These barriers, in conjunction with the constraint on the number of suitable candidates, creates a significant risk that no suitably experienced artisans will be employed.

8.7.5 Barriers to progression (engineers)

- Professional engineers are required to manage the Branch. However, they must be employed on the administrative leg for management posts as the Engineering Management leg of OSD as described in the 2009 resolution for Engineers has not been activated. There is currently no means to place them higher on the OSD salary scale. This has the perverse result that a person's salary is reduced when, e.g., a person is promoted from an OSD position, such as Chief Engineer, to Director in order to manage an engineering component.
- The Compulsory Capacity Development, Mandatory Training Days and Minimum entry requirements for SMS does not load an extra training quantity on the Unit but, also aids in the barriers to progression, from Chief Engineers to Chief Director as the entry requirement of 5 years Senior management, cannot be obtained, in the OSD environment. This while Chief Engineers earn equal that of Directors. Deputy Director General needs 8 years of which 3 must be in the Public sector senior management, adding an additional Barrier to management of a Professional team.

8.7.6 External resources

To supplement its internal capacity, the Branch is heavily dependent on the appointment of consulting engineers to investigate, design and supervise projects. The five district municipalities act as agents of the WCG for the maintenance of main, divisional and minor roads.

8.8 Financial implications

The costs associated with the RAMP can be divided into 5 components, namely:

- infrastructure management systems implementation and upgrading to maintain technical excellence and information technology standards;
- data acquisition and verification;
- data processing;
- economic analysis and reporting; and
- RAMP preparation and updating.

The costing of these components involves internal staff costs and external vendors and consultants. A cost estimate based 2022/23 RAMP is provided in Table 8-3.

Table 8-3: Estimated cost of the RAMP

Activity	Cost of external provider 2022 Rands (millions)	Cost of staff 2022 Rands (millions)	Total Cost 2022 Rands (millions)
1. Management systems operational cost	52,6	3,3	55,9
2. Data acquisition and verification	19,3		19,3
3. Data processing	Included in item 1 above	Included in item 1 above	Included in item 1 above
4. Economic analysis and reporting	0,8		0,8
5. RAMP preparation and updating	0,6	5,0	5,6
Totals	**73,3**	**8,3**	**81,6**

8.9 Overview of Asset Management Systems and Processes

As part of the asset management planning, the Branch has initiated a new efficiency system to assist the Roads Branch in the planning, design and contract management of implementing efficiency systems in terms of asset portfolio and project management.

A gap analysis on the current project, asset management and information systems were initiated in September 2018.

This exercise will form part of the System Support Services review of key asset management systems and the development of a new efficiency process system.

Chapter 9 – Plan improvement and monitoring

9.1 Performance measures

The network condition performance measures, discussed in paragraph 3.1, are used to monitor the performance of the Plan. The key performance indicators are:

- the condition of the paved road network (see Figure 4-5);
- the condition of the seals on paved roads (see Figure 4-47);
- the condition of the gravel road network (see Figure 4-9); and
- the thickness of gravel on the gravel road network (see Figure 4-54).

The trend in these indicators over time is indicative of the success or otherwise of the plan in respect of road infrastructure. Additional measures (key performance indicators – KPIs) are being developed for national use.

The future trend in the percentage of heavy vehicles that are legally loaded will indicate the success or otherwise of the plan in respect of overloading control.

9.2 Improvement programme

The weaknesses of the RAMP will be assessed every year and improvements will be made in future editions of the RAMP as soon as possible.

9.2.1 Improving the accuracy of the plan

The new RAMP guideline will enable the Branch to improve the accuracy of, and confidence in, the RAMP.

Systems improvements

Future new systems that will assist in improving the RAMP are:

- a new efficiency system, to assist the Roads Branch in the planning, design and contract management in terms of project processes;
- a maintenance management system (ROPE) to assist with the tactical level management of routine maintenance; and
- a new estimating and unit rate system to provide improved cost estimates for Branch projects that are based on historical rates sourced from completed projects.

In addition, ongoing improvements are being made:

- Bridge Management System to assist with the collection of inventory, information data and condition of bridge and structures
- PQMS modules; and
- updates to several systems to avoid technical obsolescence.

In addition, the following initiatives are planned:

- Regularly reviewing norms and standards to ensure that best practices and innovative solutions are followed;
- the promotion of cooperative governance through forums to encourage better adherence to Western Cape design standards; and
- installing and using more electronic surveillance equipment to target real overloading transgressors, without inconveniencing law-abiding operators of heavy vehicles.

It is envisaged that The RAMS Coto committee will be established to manage variables for target setting and improvement evaluation.

9.2.2 Monitoring and review procedures and reporting

Monitoring and review procedures

Performance measures are provided by the Branch's systems and monthly reports are generated. A review is done every year as part of the requirements for the Branch's Annual Performance Plan and is reported in the Department's Annual Report.

No external audit of the data in the information data bases is planned at present, mainly because this would be a major undertaking, duplicating the current internal quality assurance that verifies all the data, with very little or no expected benefit (The current internal process makes use of internal staff and capacity consultants, to ensure accuracy.

This plan will be updated every year to reflect changes in budget allocations. Road condition information is updated continually in such a manner that sufficient new information is available to rerun the dTIMS analyses at least once every two years. Therefore, it may only be possible to base the revised Desired Funding on dTIMS analyses every second year.

9.3 Strategic Network

Table 9-1 provides the implementation plan for the projects on the strategic network for the 2022/23 financial year.

Table 9-1: Implementation plan for the strategic road network for 2022/23

Project Name	IDMS Stage	Road Number	Total Length	Estimated Budget 2022/23 (R x '000)
C1105: Periodic Maintenance of TR9/2 - Du Toitskloof Pass	Works	TR00902	21,04	87 000
C0818: Rehabilitation of TR31/2 - Ashton to Montagu	Hand-over	TR03102	7,23	5 000
C1147: Periodic Maintenance of MR552, MR546, DR2220 - Lutzville	Design Documentation	MR00552	24,28	55 000
C1149: Periodic Maintenance of TR2/2 - Somerset West	Works	TR00202	8,54	40 000
C0749.02: Reconstruction and Periodic Maintenance of MR191 - Paarl to Franschoek	Design Documentation	MR00191	22,90	25 000
C1151: Periodic Maintenance of MR177 - Blackheath to Stellenbosch	Works	MR00177	10,55	64 000
C1152: Periodic Maintenance of TR77/1 - Atlantis to Ysterfontein	Works	TR07701	23,19	50 000
C1153: Periodic Maintenance of TR31/4 - Barrydale to Ladismith	Works	TR03104	45,26	60 000

Table 9-1: Implementation plan for the strategic road network for 2022/23				
Project Name	**IDMS Stage**	**Road Number**	**Total Length**	**Estimated Budget 2022/23 (R x '000)**
C1183: Periodic Maintenance of TR33/5 - Klaarstroom to Beaufort West	Works	TR03305	110,00	130 000
C1184: Periodic Maintenance of TR2/1 - Cape Town	Works	TR00201	13,80	108 000
C1125: Periodic Maintenance on TR83/1, TR83/2, TR31/5 and MR365 - Riversdale/Ladismith Area	Design Documentation	TR03105	0,48	25 000
C1000.01: Rehabilitation of TR28/2 - Hermanus to Stanford	Works	TR02802	17,80	25 228
C1155.3 Emergency flood damage repairs near Bonnievale (Bree River)	Works	MR00282	6,00	9 000
C1158.1 Emergency flood damage repairs near Stormsvlei (Sonderend River)	Works	MR00282	5,30	16 000
C1183.1 Beaufort West Area Repair and replacement of bridge and large structures	Design Documentation	TR03501	0,04	24 000
C1100: Periodic Maintenance on TR1/2, TR1/3, TR44/1, TR88/1, DR1834, MR401 AND MR402 – UNIONDALE AREA	Hand-over	TR04401 TR00103 TR08801	63,22	5 000
C1092: Periodic Maintenance on MR27 - Somerset West to Stellenbosch	Hand-over	MR00027	12,94	1 000
C0914: Rehabilitation of MR168 - Annandale Road to Polkadraai	Works	MR00168	4,38	120 000
C1093.01: Periodic Maintenance on TR30/1 Langhoogte to Villiersdorp, TR30/2 Villiersdorp to Worcester	Hand-over	TR03001 TR03002	34,05	1 000
C1102: Periodic Maintenance on MR27 , MR201 and TR25/1 - Windmeul to Wellington and Bainskloof Pass	Works	MR00201 MR00027 TR02501	13,76	23 000
C1090.01: Periodic Maintenance of TR11/1 - Bosmansdam and Potsdam	Hand-over	TR01101	7,50	3 000
C1095: Periodic Maintenance on MR238 - Vredenburg to Saldanha	Hand-over	MR00238	9,15	1 000
C1148: Periodic Maintenance of TR2/10, MR347 and TR1/1 - Knysna	Works	TR00101 MR00347 TR00210	12,36	70 000
C1115: Periodic Maintenance on TR2/1 - Eerste Rivier to Somerset	Works	TR00201	11,30	2 000
C1037.01: Construction of groynes in the Swart River adjacent to bridge No. 2704 along TR34/1 - Prince Albert road to Prince Albert	Hand-over	TR03401	0,10	500

Table 9-1: Implementation plan for the strategic road network for 2022/23				
Project Name	**IDMS Stage**	**Road Number**	**Total Length**	**Estimated Budget 2022/23 (R x '000)**
C1000: Upgrade of TR28/2 - Stanford to Gansbaai	Works	TR02802	19,22	130 000
C0838.06: Rehabilitation and Reseal of various sections on MR269 - Sandbaai to Caledon	Works	MR00269	17,74	93 790
C1091: Periodic Maintenance on TR32/1 - Ashton to Swellendam and MR288 - Jan Harmansgat to Bonnievale	Hand-over	TR03201	31,20	1 000
C1116: Periodic Maintenance on TR22/2, TR22/1 and MR316 - Ceres to Touwsrivier	Design Documentation	TR02201 TR02202	86,44	10 000
C1123: Periodic Maintenance on TR35/1 - Beaufort West to Aberdeen	Hand-over	TR03501	55,41	3 000
C1104: Periodic Maintenance on TR33/4 - De Rust to Klaarstroom, and TR34/2 - Klaarstroom to Prince Albert	Works	TR03304 TR03402	36,55	80 000
C1143: Periodic Maintenance of TR32/1, TR31/3, TR65/1, DR1354, DR1352, OP6074, OP6072 and OP6069 - Swellendam	Works	TR03103 TR03201 TR06501	59,91	95 000
C1025.04: Periodic Maintenance of TR9/1 - Cape Town	Hand-over	TR00901	10,84	2 000
C1082.01: Periodic Maintenance on TR24/1 - Malmesbury to Hermon	Hand-over	TR02401	24,76	1 000
C0964.02: Upgrade of TR33/1 - Beach Road Boulevard West to Garret Street	Works	TR03301	9,56	110 000
C1047.02: The widening of Bridge No. 2221 over the Maalgate River at 15.1km on TR2/9	Works	TR00209	0,08	8 000
C1025.01: Upgrade of Refinery Interchange on TR11/1	Works	TR01101	0,11	135 000
C1102.01: The Upgrade of MR201 - N1 to Kliprug Road	Works	MR00201	3,75	80 000
			840,74	1 698 518

Chapter 10 – Job creation and skills development

10.1 Expanded Public Works Programme

10.1.1 Approach

The revised strategy for EPWP is focused on improvements in the following areas:

- the number of work opportunities created;
- informal training;
- formal training; and
- a greater focus on maintenance to ensure sustainability of work training opportunities.

A systematic analysis of the above areas has resulted in the following recommendations:

- Communication and coordination between various authorities and Branches should be improved.
- The Branch prioritise greater utilisation of longer (15 to 24 month) contracts in the routine road maintenance area as it is easier to implement and more sustainable.

The following approach to the expansion of the job creation has been adopted:

- A renewed focus will be put on maintenance activities to increase the number of work opportunities, the duration of employment, and the opportunities for training.
- The duration of routine road maintenance contracts will be indevoured to be increased to a minimum of 24 months.
- Contract documentation will have specific provisions for Construction Industry Development Board (CIDB)-registered subcontractor development.
- Training will be done with officials on the methodology of labour-intensive approaches to construction and maintenance.

A refinement of PRMG requirements and the identification and prioritisation of projects based on the five S'Hamba Sonke pillars, i.e. labour intensity, improved access, asset management, safe roads and increased investment will be required.

10.1.2 Job creation commitments for 2022/23

The national benchmarks for each sector are set by the Department of Public Works, which is also the custodian of the national reporting platform. The Branch's performance targets to support economic growth and empowerment through road-based transport infrastructure investment are shown below:

- Work opportunities: 4 500;
- Number of youth employed: 2 400;
- Number of women employed: 1 200; and
- Number of persons with disabilities employed: 5.

The projected deliverables (i.e. work opportunities) based on the Branch's 2021/22 programme is shown in the job creation estimates (Appendix M – Job creation estimates).

10.1.3 EPWP/PRMG national site visits

During each delivery cycle, the national Department of Transport requests the identification of two pilot projects for a national visit. Construction sites were selected during the 2021/22 financial cycle for their combined contribution to meeting the PRMG (S'Hamba Sonke) principles (listed in paragraph 10.1.1).

The following sites were inspected by National Department of Transport in March 2022:

- C0822: Rehab MR344 & DR1578 - Glentana; and
- C1000.01: Rehab TR02802 between Hermanus & Stanford.

10.1.4 Statistics regarding developmental training

The attached detailed spreadsheet (Appendix N – Contractor development training) indicates that there were over 45 service opportunities to indirect contractors in the 2021/22 financial year as of March 2022. It also details the subcontractors involved in training and delivery and the type of training conducted.

Based on project-categorisation, the summary forecasts are projected for 2022/223 and are shown in Table 10-1 and the details in Table 10-2.

Table 10-1: Summary forecast of PRMG projects March 2022

Type of Activity	No of Project	Estimated Budget 2022/23 (R x '000)
Periodic Maintenance	14	R 851 000
Rehabilitation	2	R 26 000
Safety	1	R 8 000
Special Maintenance	3	R 49 000
Routine Maintenance	2	R 23 000
Grand Total	**22**	**R 957 000**

Table 10-2: Details of PRMG training projects March 2022

No. of Projects	Type of Activity	IDMS Stage	Estimated Budget 2021/22 (R x '000)	*SMMEs SMME Contract Value (R x '000)	*SMMEs No.
14	**Periodic Maintenance - Total**		**851 000**		**68**
	C1088.01: Periodic Maintenance on MR267 - Stanford to (N2) Riviersonderend	Works	105 000	8 000	6
	C1102: Periodic Maintenance on MR27 , MR201 and TR25/1 - Windmeul to Wellington and Bainskloof Pass	Works	23 000	4 000	4
	C1103: Periodic Maintenance on TR2/12 from Kurland to Eastern Cape Border (Bloukrans Pass)	Works	78 000	32 000	4
	C1104: Periodic Maintenance on TR33/4 - De Rust to Klaarstroom, and TR34/2 - Klaarstroom to Prince Albert	Works	80 000	8 000	6
	C1115: Periodic Maintenance on TR2/1 - Eerste Rivier to Somerset	Hand-over	2 000	0	0
	C1123: Periodic Maintenance on TR35/1 - Beaufort West to Aberdeen	Hand-over	3 000	0	0
	C1124: Periodic Maintenance on MR334, MR337, DR1532 and DR1525 - Herbertsdale/Gouritsmond Area	Hand-over	3 000	0	0
	C1143: Periodic Maintenance of TR32/1, TR31/3, TR65/1, DR1354, DR1352, OP6074, OP6072 and OP6069 - Swellendam	Works	95 000	10 000	8
	C1148: Periodic Maintenance of TR00210 - Knysna	Works	70 000	8 000	6

Table 10-2: Details of PRMG training projects March 2022					
No. of Projects	Type of Activity	IDMS Stage	Estimated Budget 2021/22 (R x '000)	*SMMEs	
				SMME Contract Value (R x '000)	No.
	C1149: Periodic Maintenance of TR00202 - Somerset West	Works	40 000	5 000	6
	C1151: Periodic Maintenance of MR00177 - Blackheath to Stellenbosch	Works	40 000	5 000	6
	C1152: Periodic Maintenance of TR07701 - Atlantis to Ysterfontein	Works	40 000	5 000	6
	C1183: Periodic Maintenance of TR33/5 - Klaarstroom to Beaufort West	Works	130 000	22 000	10
	C1184: Periodic Maintenance of TR2/1 - Cape Town	Works	108 000	10 000	6
2	**Rehabilitation - Total**		**26 000**		**6**
	C0749.02: Recontruction and Periodic Maintenance of MR191 - Paarl to Franschoek	Design Documentation	25 000	4 000	6
	C1094: Rehabilitation of MR531 - Elandsbaai and Periodic Maintenance of MR540 - Leipoldtville	Hand-over	1 000	0	0
1	**Safety project - Total**		**8 000**		**4**
	C1047.02: The widening of Bridge No. 2221 over the Maalgate River at 15.1km on TR2/9	Works	8 000	2 000	4
3	**Safety project - Total**		**49 000**		**8**
	C1155.3 Emergency flood damage repairs near Bonnievale (Bree River)	Works	9 000	1 000	1
	C1158.1 Emergency flood damage repairs near Stormsvlei (Sonderend River)	Works	16 000	1 000	1
	C1183.1 Beaufort West Area Repair and replacement of bridge and large structures	Design Documentation	24 000	4 000	6
2	**Routine Maintenance - Total**		**23 000**		**10**
	C1212.01: Routine Road Maintenance	Works	15 000	3 000	6
	Maintenance related Framework Agreement Contracts	Works	8 000	2 000	4

10.2 Number of jobs created

The number of jobs created per programme since 1 April 2014 is shown in Table 10-3.

Table 10-3: Jobs created per programme since 1 April 2014							
Work Opportunities	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
Work Opportunities	9 033	7 860	7 748	3 853	5 934	6 994	4 000
Work Opportunities (Women)	2 463	2 244	2 119	944	1 628	2 135	1 114
Work Opportunities (Youth)	6 081	5 249	5 016	2 510	3 797	4 517	2 247

The job creation estimates for 2021/22 are provided in Appendix M – Job creation estimates.

10.3 Skills development for graduates

In response to the shortage of staff in the Branch, particularly in the professional and technical positions, the Branch is conducting a comprehensive Engineer and Technician Recruitment and Training Programme, which facilitates the training and registration of civil engineering professionals. This programme supports the Departmental Skills Development Strategy (Western Cape Government: Transport and Public Works, 2005) that was finalised in 2005.

The purpose of the candidate development programme is to provide newly graduated technicians, technologists and engineers exiting from the Masahki'Sizwe Bursary Programme with a high standard of workplace experience to allow them to register as professionals with the Engineering Council of South Africa (ECSA) in the shortest period of time, and also to retain as many of these graduates to fill vacant posts in the Branch.

The workplace experience provided is designed to incorporate exposure to all phases of the project lifecycle i.e., conception, design, construction and maintenance. The development programme therefore includes deployment to civil engineering construction companies and consulting engineering companies. Candidates are also deployed in the Design, Planning and Construction Directorates within the Branch and, in certain cases, to DRE offices.

The professional development programme has expanded to include mechanical engineers and GIS professionals as from 2020.

Table 10-4 provides a summary of the graduates taken into the programme since its inception in 2010. The revised statistics as shown in Table 10-4 includes graduates that obtained their professional registration after leaving the Professional Development Programme.

<table>
<tr><th colspan="10">Table 10-4: Summary of graduates since inception in 2010</th></tr>
<tr><th rowspan="3">Year</th><th colspan="4">Intake</th><th colspan="3">Completion</th><th rowspan="3">Current Number</th></tr>
<tr><th colspan="2">Category</th><th colspan="2">PDI</th><th rowspan="2">Departures</th><th colspan="2">Registration</th></tr>
<tr><th>Engineers</th><th>Technician/ Technologist/GISc</th><th>Male</th><th>Female</th><th>Pr Eng</th><th>Pr Techni /Tech or GISc</th></tr>
<tr><td>2010</td><td>7</td><td>2</td><td>4</td><td>5</td><td>0</td><td>0</td><td>0</td><td>9</td></tr>
<tr><td>2011</td><td>8</td><td>0</td><td>5</td><td>1</td><td>0</td><td>0</td><td>0</td><td>17</td></tr>
<tr><td>2012</td><td>5</td><td>1</td><td>3</td><td>1</td><td>0</td><td>0</td><td>0</td><td>23</td></tr>
<tr><td>2013</td><td>3</td><td>1</td><td>2</td><td>1</td><td>0</td><td>0</td><td>0</td><td>27</td></tr>
<tr><td>2014</td><td>1</td><td>1</td><td>1</td><td>0</td><td>4</td><td>0</td><td>0</td><td>25</td></tr>
<tr><td>2015</td><td>6</td><td>2</td><td>3</td><td>2</td><td>8</td><td>2 (2)</td><td>1</td><td>22</td></tr>
<tr><td>2016</td><td>3</td><td>4</td><td>2</td><td>3</td><td>2</td><td>5 (3)</td><td>0</td><td>22</td></tr>
<tr><td>2017</td><td>5</td><td>5</td><td>4</td><td>4</td><td>0</td><td>3 (1)</td><td>2</td><td>27</td></tr>
<tr><td>2018</td><td>4</td><td>6</td><td>5</td><td>4</td><td>2</td><td>0</td><td>0</td><td>35</td></tr>
<tr><td>2019</td><td>0</td><td>3</td><td>0</td><td>3</td><td>3</td><td>3 (3)</td><td>1</td><td>31</td></tr>
<tr><td>2020</td><td>9</td><td>4</td><td>4</td><td>6</td><td>2</td><td>4</td><td>5</td><td>33</td></tr>
<tr><td>2021</td><td>7</td><td>2</td><td>0</td><td>6</td><td>2</td><td>3</td><td>1</td><td>36</td></tr>
<tr><th rowspan="3">TOTAL</th><td>58</td><td>30</td><td>33</td><td>36</td><td rowspan="2">23</td><td>20 (9)</td><td>10</td><th rowspan="3">TOTAL</th></tr>
<tr><td colspan="2" rowspan="2">88</td><td colspan="2" rowspan="2">69</td><td colspan="2">30 (9)</td></tr>
<tr><td colspan="3">53</td></tr>
</table>

* Amounts in parenthesis are graduates that obtained their professional registration after departing the Branch.

The practical skills developed during the workplace training include:

- Planning and design: Investigation and problem resolution:
  - Geometric design;
  - Hydraulics and hydrology;
  - Pavement design;
  - Structural design of bridges and culverts;
  - Traffic engineering and traffic modelling;
  - Pavement engineering and materials; and
  - Procurement documentation.
- Site supervision: Acting as assistant resident engineers, the graduates gain experience in materials testing, quality control, contract documentation, measurement and payment certification.
- Routine maintenance: Where deployed to the DRE offices, participants gain experience in route inspections, unpaved and paved road assessments, and supervision of routine road maintenance and flood damage repairs.
- Construction experience:
  - Measurement and costing;
  - Site administration and contract planning and programming;
  - Site survey and setting out;
  - Quality assurance;
  - Occupational health and safety;
  - Construction methods and management of:
    - Road surfacing – asphalt and seals;
    - Road surface maintenance – milling and recycling;
    - Traffic accommodation;
    - Underground services;
    - Earthworks – bulk and half-width construction on rehabilitation projects;
    - Layer works including subbase and basecourse; and
    - Concrete works – culverts, head and wing walls, as well as bridge construction.

Up to the end of March 2022, 39 candidates have achieved professional registration with ECSA – 29 engineers, 9 technologists/technicians and 1 GIS professional.

10.4 Contractor development

Contractor training spreadsheet containing current development initiatives are provided in Appendix N – Contractor development training.

10.4.1 Contractor Development Programme Policy Framework

The Contract Development Policy was approved on 31 March 2016 and has the following outline:

- CIDB Grade 1 – 3:
  - training based on business, management, administrative and financial capacity; and
  - focuses on dedicated works on a more local and regional level;
- CIDB Grades 3 – 5
  - based on indirect targeting (dedicated subcontracting work);
  - focuses on technical capacity and service delivery;
  - is based on a needs analysis;
  - incorporates mentorship via accredited bodies and from the main contractor; and
  - includes performance evaluation and monitoring to ensure growth and compliance.
- CIDB Grades 5 – 6:
  - based on direct targeting via routine road maintenance and other mechanisms;
  - is limited, and further training is based on a need analysis;
  - incorporates mentorship and coaching; and
  - includes performance evaluation and monitoring to ensure growth and compliance.

Chapter 11 – Strengths-weaknesses-opportunities-threats (SWOT) and risk analysis

11.1 SWOT analysis

An analysis of the strengths, weaknesses, opportunities and threats (SWOT) relevant to the Branch is shown in Table 11-1.

Table 11-1: SWOT analysis of the branch

Issue	Strengths	Weaknesses	Opportunities	Threats
Asset management	Programme and project management capability, enables effective management of the organization	In many instances, project priorities are not explicitly defined, and projects are not explicitly associated with strategic objectives	Improvements in the optimization of expenditure to achieve "value-for-money" Improvements in the alignment between projects and strategy	Not optimising the full scope of the work undertaken by the Branch
Asset Information systems	Good systems for monitoring network performance and prioritising projects	The lack of: • Electronic maintenance management system for surfaced roads • Unit rate and estimating system • Dedicated Asset information management systems staff • The scope of assets in dTIMS is not comprehensive	Acquire new systems Business processes improvements	Governance of asset information is inadequate, leading to a lack of credibility in the information provided and possible poor decisions based on inaccurate information
Staffing	Dedicated, capable senior management team and professionals	Key professional and administration positions remain vacant	Recession may make it easier to recruit and retain professional staff New professional staff may reduce the dependence on consultants	Uncompetitive remuneration levels at professional level makes it difficult to attract and retain professional staff The large number of vacant posts undermines the ability of the Branch to manage its assets, thereby undermining the economy of the Western Cape

Table 11-1: SWOT analysis of the branch				
Issue	**Strengths**	**Weaknesses**	**Opportunities**	**Threats**
Funding		Single source of funding for reducing the backlog		Under-funding of the Branch increases the backlog causing the road network to deteriorate to a point where it cannot be economically repaired or maintained Possible expenditure impacts on the Branch's assets
Organisational structure	The in-house expertise available for re-organising the structure to support good asset management	Limited amount of current staff to fill the new posts in structure to support of asset management	New posts and positions in structure to support asset management	The long duration of filling the new posts due to funding and recruitment processes.

11.2 Risk register

The RAMP's risk register was updated with the information obtained from the Department's Strategic Objectives / Programme Risks Report Q3 2019/20. The legend is shown in Table 11-2. Risk is rated according to its level shown for its impact and likelihood.

Table 11-2: Legend for impact and likelihood			
Impact			
Low	**Moderate**	**High**	**Extreme**
Negative outcomes or missed opportunities that are likely to have a negligible impact on the ability to meet objectives. Event will be controlled through normal management processes.	Negative outcomes or missed opportunities that are likely to have a relatively moderate impact on the ability to meet objectives. Event resulting in breakdown of core business process activity.	Negative outcomes or missed opportunities that are likely to have a relatively substantial impact on the ability to meet objectives. Event resulting in breakdown of core business process.	Negative outcomes or missed opportunities that are of critical importance to the achievement of the objectives. Critical event resulting in breakdown of core business service.
Likelihood			
Unlikely	**Moderate**	**Likely**	**Almost Certain**
Highly unlikely that the adverse event/ opportunity will occur (0 – 20% likelihood of occurring). The adverse event/ opportunity occurs infrequently and is unlikely to occur in the next 5 years.	Unlikely but there is a slight possibility that the adverse event/ opportunity will occur (21 - 50% likelihood of occurring). There is an above average chance that the adverse event/ opportunity will occur at least once in the next 36 – 60 months.	Likely that the adverse event/ opportunity will occur (51 – 80% likelihood of occurring). History of occurrence internally or at similar institution. It is likely to occur in the next 12 – 36 months.	Adverse event/ opportunity will definitely occur (more than 80% likelihood of occurring). It is likely to occur more than once in the next 12 months.

The risk register created is shown in Table 11-3 on the next page.

Table 11-3: Risk register			
Risk issue	**Impact on service delivery**	**Risk likelihood**	**Mitigation measures**
Risks related to institutional issues			
Governance of asset information is inadequate	High	Almost Certain	IT Steer committee created, which will address this issue – control addresses the risk
Organisational sustainability in terms of the effect of stringent OSD requirements that creates difficulties in attracting and retaining professional staff and the extended duration of organisational development negatively affects programme performance and the ability to deliver on its objectives	High	Almost Certain	• Lobby DPSA for a review of OSD requirements • Creation of salary dispensation for engineers (OSD), which could result in more attractive packages for professionals • Annual intake of graduates • Engineer and technical practical training programme (Roads Professional Development Programe – PDP) was introduced and registered with the relevant professional associations • Establishment of a professional development committee to coordinate the Roads PDP • Exposing current staff to further professional development opportunities (e.g. conferences, seminars, workshops and forums) • Head-hunting and succession planning as well as up skilling of current graduate candidate engineers and technicians for vacant posts and as contract managers in our regions • More in-house work is undertaken in order to provide development opportunities to assist with up skilling and training of staff • New Organisational structure will result in more appropriate posts and salary levels • Providing retention and succession planning-incentives and strategies. • Retaining the services of professionals after reaching retirement age • controls partially address the risk
Organisational sustainability in terms of the limited new appointments due to cost of employment (CoE) being capped	High	Almost Certain	Lobby to fund unfunded posts– controls partially addresses the risk
Continued under-funding of the Branch leads to an inability to maintain the provincial road network to an optimal standard which could lead to a gradual collapse of the provincial road network, jeopardising the safety of road users and the reliability of the road infrastructure	Extreme	Almost Certain	• Motivate for increased roads budget using details in the Road Asset Management Plan • Apply optimised budget and projects to achieve lowest cost for maintaining the network • Improve project selection by optimising maintenance strategies via multi-criteria models (built management systems) that inform decision-making • Controls partially address the risk

Table 11-3: Risk register			
Risk issue	**Impact on service delivery**	**Risk likelihood**	**Mitigation measures**
Inability to complete economic projects which could result in the Programme utilising equitable share funds which could result in the increase of the maintenance backlog and limit economic infrastructure growth. Asset Finance Reserve (AFR) fund being reduced and/or terminated	Extreme	Almost Certain	• Lobbied for funding through the Asset Finance Reserve Fund. As a result of this, Treasury allocated additional funding in the 3rd year of the MTEF • This has then completely mitigated the issue Road Asset Management Plan (RAMP) of the Western Cape (issued annually) is used to motivate for increased roads budget
Opportunity to create jobs is constrained which negatively affects the government's broader objectives such as job creation, economic development and social equity	High	Almost certain	• The PRMG from National Department of Transport is a major vehicle for the Branch to address job creation • Ensure focused attention is given to the broader socio-economic objectives and include policy implementation (i.e. Develop a Labour Intensive Construction Framework) • Routine road maintenance contracts are being restructured to make them more EPWP-compliant and expanded to enhance job opportunities. • Focus on doing more routine maintenance on contract to increase temporary work opportunities
Onerous approval processes of borrow pits by the Department of Mineral Resources (DMR), which may affect the Branch's ability to deliver on objectives	Extreme	Likely	• Further discussions with DMR (also through consultants) regarding changes, implementations and priorities • Continuous engagement with stakeholders to set business processes in place • Controls partially address the risk
Lack of internal expertise in environmental assessment	Extreme	Likely	• Outsourcing the functions • Controls partially address the risk
Staff and outsourced resources are exposed to dangerous (high risk) working areas in fulfilling their normal duties	Extreme	Likely	• Full time employed OHS officials periodically performs site visits • Contracted employees to improve construction methods and procedures and train staff • Continuous awareness to staff on working conditions • Additional security is hired for contractors after review and approval • Team communication via radio connectivity to inform team of safety alerts • Utilisation of traffic safety teams for management of safety concerns in construction works • Business Continuity plan in place

Table 11-3: Risk register			
Risk issue	**Impact on service delivery**	**Risk likelihood**	**Mitigation measures**
Suboptimal use of funds due to the maintenance works and new assets not being fully optimised	High	Almost Certain	• Implement demand management plan for new projects based on Western Cape Transport Model predictions • Accelerate the optimisation of the full scope of works through incorporation in dTIMS • Creation and implementation of a comprehensive maintenance management system – control addresses the risk
Strategy for maintenance and upgrading of gravel roads not finalised	High	Almost Certain	Review and finalise the strategy for upgrading and maintenance of gravel roads
Deteriorating trend of the condition of the road network to below acceptable levels of service	High	Almost Certain	Concentrate on reducing the deterioration by addressing drainage and resealing – controls partially address the risk
Traffic demand on the network leading to congestion in the Cape Metropolitan Area	High	Almost Certain	Plan and fund increase in road space where appropriate – controls partially address the risk
Effects of climate change inducing extreme weather conditions and consequential damage through flooding and the effect of extreme heat on asphalt pavement layers	High	Almost Certain	• Concentrate on reducing the effects of extreme weather by addressing drainage and reseal – controls partially addresses the risk • Use bitumen binders that tolerate higher temperatures – controls partially address the risk
Scarcity of gravel for maintaining unpaved roads creating a high demand for upgrading to paved standards	High	Almost Certain	Reduce the demand for gravel by: • Applying best practice for regravelling and blading maintenance • Establish the optimum number of borrow pit for maintenance and regravelling and thereby reducing the demand to upgrade gravel roads • Controls partially address the risk
Scarcity of base aggregates for paved roads	Moderate	Almost Certain	Recycle base wherever possible and use of alternative technology - controls partially addresses the risk
Scarcity of water for compaction	Moderate	Almost Certain	Explore the use of sea and mineralised water – controls partially address the risk
Variable quality of bitumen available for seals and asphalt	Moderate	Moderate	Monitor the quality of bitumen – controls partially address the risk

11.3 Findings and conclusions

There are many high risks relating to the institutional issues, resources and infrastructure assets. The ability of the Branch to effectively mitigate many of the risks is limited and can only be partially addressed. The cumulative effects of not being able to deal with these risks effectively over the last 20 years has led to a situation where the Branch's staff and funding resources have reached a fragile state.

In conclusion, the future demands, complexity and turbulence in managing the road infrastructure assets are expected to increase and there is a high probability that situations will arise that test the Branch's ability to adequately manage the road network in its mission to effective support economic growth.

Chapter 12 – Conclusions and recommendations

12.1 Conclusions

The following was concluded:

- The Branch has provided detailed analysis of the needs of the network and determined the minimum funding required for a sustainable network that will provide the levels of service required to support the economy of the Western Cape.
- This minimum funding is approximately R4,2 billion per year over the next 10 years more than provided in the MTEF Budget.
- The immediate filling of posts and sourcing of staff within the new organogram micro-structure to minimise the impact on service delivery.
- The Branch's asset management systems provide excellent support for effective management.

12.2 Recommendations

The Branch should focus on the following issues to address the preservation of the network as effectively as possible for the available MTEF budget:

- Expand the scope of work that is optimised in the Branch's resource allocation system (dTIMS).
- Review the levels of service targets on the network where appropriate, bearing in mind that road users and the economy will pay the price in the form of excess user costs.
- Ensure the most appropriate design and delivery solutions incorporating proven new technologies are consistently chosen and implemented to appropriate standards.
- Improve the effectiveness and efficiency of high priority preservation and maintenance activities to reduce the rate of deterioration of the network.
- Minimise overhead costs.
- Construct additional weighbridges to deter overloading, where cost effective.
- Implement measures to identify and propose treatments on bridges and other structures from the asset information collected, including their asset value.

With respect to enabling the Branch, it is recommended that:

- The immediate filling of posts and sourcing of staff within the new organogram micro-structure to minimise the impact on service delivery.
- Utilise the asset management maturity assessment in accordance to TMH 22 (Committee of Transport Officials, 2013), to assist the Branch in identifying gaps and creating action plans for improving asset management; and
- System improvements are implemented to close identified gaps.

Chapter 13 References

AASHTO. (2002). *Transportation asset management guide.* Washington DC: American Association of State Highway and Transportation Officials.

Aurecon. (2013). *HDM-4 Calibration study for the Western Cape Government.* Pretoria: Western Cape Government.

Austroads. (2009). *Guide to Asset Management Part 1: Introduction to Asset Management.* Sydney: Austroads.

Austroads. (2009). *Guide to Asset Management Part 3: Asset Strategies.* Sydney: Austroads.

British Standards Institute. (2008). Publically Available Standard 55: 2008. *Publically Available Standard 55: 2008*. British Standards Institute.

Climate Adaption Platform. (2017). *Workshop Booklet - 11 January 2017*. Washington DC: Climate Adaption Platform.

Committee of State Road Authorities. (1990). *TRH 20: The structural design, construction and maintenance of unpaved roads (draft)*. Pretoria: Department of Transport.

Committee of State Road Authorities. (1992). *TMH 9: Pavement Management Systems: Standard Visual Assessment Manual for Flexible Pavements.* Pretoria: Department of Transport.

Committee of State Road Authorities. (1994). *TRH 22: Pavement Management Systems.* Pretoria: Department of Transport.

Committee of State Road Authorities. (1996). *TRH 4: Structural design for flexible pavements for interurban and rural roads.* Pretoria: Department of Transport.

Committee of Transport Officials. (2012). *TRH 26: South African Road Classification and Access Management Manual.* Pretoria: SANRAL.

Committee of Transport Officials. (2013). *draft TMH 22: Road asset management manual.* Pretoria: SANRAL.

Committee of Transport Officials. (2013). *TMH 22: Road asset management manual (draft)*. Pretoria: SANRAL.

Committee of Transport Officials. (2015). *TRH 9: Manual for Visual Assessment of Road Pavements, Part E: Unpaved Roads (draft)*. Pretoria: SANRAL.

Committee of Transport Officials. (2016). *Manual for the visual assessment of road structures (draft)*. Pretoria: South African National Road Agency SOC Ltd.

Committee of Transport Officials. (2016). *TMH 13 Automated Road Condition Assessments Part A: General (draft)*. Pretoria: South African National Roads Agency.

Davies, R. (n.d.). *An Introduction to Asset Management.* Chester, UK: blah d blah design Ltd.

De Vos, E., Henderson, M., & Wolmarans, I. (2017). Augmenting the LCCA objective function to improve economic equity in network optimisation of the Western Cape, South Africa. *World Conference on Pavement and Asset Management 2017.* Milan: WCPAM2017.

Department of Environmental Affairs. (2013). *Long-Term Adaptation Scenarios Flagship Research Programme for South Africa: Climate Trends and Scenarios for South Africa.* Pretoria: Department of Environmental Affairs. Retrieved from https://www.sanbi.org/sites/default/files/documents/documents/

Department of Transport. (2006). *Road Infrastructure Strategic Framework for South Africa*. Pretoria: Department of Transport.

Department of Transport. (2017). *Draft White Paper on Roads Policy for South Africa.* Petoria.

Department of Transport and Public Works. (2019, June). *Provincial Freight Strategy*. Retrieved from Western Cape Government: https://www.westerncape.gov.za/sites/www.westerncape.gov.za/files/freight_strategy_august_2019.pdf

Department of Transport and Public Works. (2020, February 28). *Annual Performance Plan for the fiscal year 1 April 2020 to 31 March 2021*. Retrieved July 17, 2017, from Western Cape Government: https://www.westerncape.gov.za/sites/www.westerncape.gov.za/files/dtpw_app_2020-21_final_printed_version_4_mar_2020.pdf

Department of Transport and Public Works. (2020, February 28). *Strategic Plan 2020/21 – 2024/25*. Retrieved July 17, 2017, from Western Cape Government: https://www.westerncape.gov.za/sites/www.westerncape.gov.za/files/dtpw_sp_final_printed_document_4_mar_2020.pdf

ESCAP. (2020). *The Impact and Policy Responses for COVID-19 in Asia and the Pacific.*

Global Forum on Maintenance and Asset Management. (2014). *The Asset Management Landscape Second Edition.* Global Forum on Maintenance and Asset Management.

Henderson, M. (2015). *Guide to a Road System Manager for the Western Cape (draft).* Cape Town.

Institute of Asset Management. (2004). *PAS 55-1: Asset Management, Part 1: Specification for the opimized management of physical infrastructure assets.* British Standards Institute.

Institute of Asset Management. (2015a). *Asset information, strategy, standards and data management.* Institute of Asset Managment.

Institute of Asset Management. (2015b). *Asset Management - an anatomy V2.* Institute of Asset Management.

Institute of Asset Management. (2015c). *Life Cycle Value Realisation Version 1.1.* Bristol: Institute of Asset Management.

Institute of Asset Management. (2015d). *Organisation and people Version 1.* Briston: Institute of Asset Mananagement.

International Standards Organization for Standardization. (2015). *SANS ISO 55001:2015 (Ed.1) Asset management - Management systems - Requirements.* Pretoria: South African Bureau of Standards.

Lawless, A. (2005). *Numbers and Needs : Addressing imbalances in the civil engineering profession.* Johannesburg: SAICE.

Lloyd, C. (2010). *Asset management - whole-life management of physical asset.* London: Thomas Telford Ltd.

Maughan, A. (2013). Value, not volume, should drive investment in roads. *ARRB Low Volume Roads Symposium.* Cairns.

Page-Green, D. P. (1996). *An assessment of deterioration models for Gravel Road Management Systems.* Pretoria: CSIR.

Parliament of the Republic of South Africa. (1998). *National Environmental Management Act107 of 1998.* Pretoria: Government Printer.

Parliament of the Republic of South Africa. (2002). *Mineral and Petroleum Resources Development Act 28 of 2002.* Pretoria: Government Printer.

Parliament of the Republic of South Africa. (2013). *Spatial Land Use Management Act.* Pretoria: Government Printer.

Parliament of the Repulic of South Africa. (1999). *Public Finance Management Act no. 1 of 1999, as revised.* Pretoria: Government Printer.

Porras, J. D., Han, Z., & Zhang, Z. (2014). A Fair Division Approach to Performance-based Cross-Asset Resource Allocation. *9th International Conference on Managing Pavement Assets.* Alexandria: ICMPA9.

Porter, M. (2008). *Competitive Advantage: Creating and Sustaining Superior Performance.* New York: Simon and Schuster.

Roads Traffic Management Corporation. (2012). *Revision of the South African Road Safety Audit Manual Volume 4.* Pretoria.

Roberts. (2020, May 28). *Developing Organization Resilience through Asset Management to Respond to COVID-19.* Retrieved from The Institute of Asset Management : https://theiam.org/news/developing-organization-resilience-through-asset-management-to-respond-to-covid-19/

Robertson, N. (2004). A classification of road investment decision support systems: practical applications', International conference on managing pavement assets. *Proceedings of the 6th International Conference on managing pavement assets.* Brisbane: FHWA.

South Africa. (2007). Government Immovable Asset Management Act, 2007. In *Government Immovable Asset Management Act, 2007* (pp. 509(30520): 1-18). Cape Town: Government Gazette. Retrieved from https://www.gov.za/documents/acts

South African Road Agency SOC Ltd. (2016). Performance Indicators. *Performance Indicators*. Pretoria: South African Road Agency SOC Ltd.

TMR. (2010). *The Interim Guide to the RSM Framework within Transport and Main Roads.* Brisbane: Queensland Department of Transport and Main Roads.

Western Cape Government. (2013). Growth Potential Study. *Growth Potential Study*. Cape Town, Western Cape, South Africa: Western Cape Government. Retrieved from https://www.westerncape.gov.za/eadp/your-resource-library

Western Cape Government. (2013). *Growth potential study 2013.*

Western Cape Government. (2014). *Growth potential of towns in the Western Cape.* Retrieved 2017, from Western Cape Government: https://www.westerncape.gov.za/eadp/sites/default/files/news/files/2013-10-15/2013-growth-potential-study-of-towns-report_0.pdf

Western Cape Government. (2014). *Western Cape Provincial Spatial Development Framework.* Retrieved 2017, from https://www.westerncape.gov.za/eadp/content/2014-provincial-spatial-development-framework-psdf

Western Cape Government. (2015). *2014 Additions to the dTIMS Analysis Version 2.0.* Cape Town: Unpublished report.

Western Cape Government. (2016). *Road Network Information System – Data Recording for road inventory.* Cape Town: Western Cape Government.

Western Cape Government: Transport and Public Works. (2005). *Departmental Skills Development Strategy (draft).* Cape Town: Western Cape Government: Transport and Public Works.

Volume 2 of 2:
Appendices

ROAD ASSET MANAGEMENT PLAN

2022/23 TO 2031/32

VOLUME 2: APPENDICES

DEPARTMENT OF TRANSPORT & PUBLIC WORKS

ROAD NETWORK MANAGEMENT BRANCH

C O N T E N T S

Note: This document is formatted according to the corporate branding of the Western Cape Government. The colour palette used can be found in Appendix R – Corporate Branding.

This page is intentionally blank

Appendices

Appendices Appendix A – Road Asset Management Policy to Appendix R – Corporate Branding are contained in this section.

Appendix A – Road Asset Management Policy

Road Asset Management Policy

1. Background

Asset management is defined as the systematic and coordinated activities and practices through which the Branch optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life for the purpose of achieving corporate objectives.

1.1 International Asset Management Standard

International asset management specifications highlight the importance of corporate asset management policies as part of an integrated suite within an Asset Management System. The contents of this policy should conform to the direction and intent of the SANS 55000 Asset Management. SANS 55001:2015 specifies that an organisation shall establish an asset management policy that:

'a) is appropriate to the purpose of the organisation;

b) provides a framework for setting asset management objectives;

c) includes a commitment to satisfy applicable requirements;

d) includes a commitment to continual improvement of the asset management systems.

The asset management policy shall:

- be consistent with the organisation plans;
- be consistent with other relevant organisational policies;
- be appropriate to the nature and scale of the organisation's assets and operations;
- be available as documents information;
- be communicated within the organisation;
- be available to stakeholders;
- be implemented and be periodically reviewed and, if required, updated.'

1.2 Legislative requirements

This policy will align the Branch with international best practice and conform to the requirements of the following Acts:

- Constitution of the Republic of South Africa, (Act 108 of 1996).
- The Constitution of the Western Cape, 1998 (Act 1 of 1998).
- Public Finance Management Act, 1999 (Act 1 of 1999 as amended by Act 29 of 1999) and Regulations.
- Public Service Act, 1994 (Act 103 of 1994) and Regulations, 2001 and 2016.
- Western Cape Land Administration Act, 1998 (Act 6 of 1998). National Land Transport Act, 2009 (Act 5 of 2009) and Regulations.
- National Road Traffic Act, 1996 (Act 93 of 1996).
- Cape Roads Ordinance, 1976 (Ord, 19 of 1976).
- Advertising Along Roads and Ribbon Development Act, 1940 (Act 21 of 1940).
- Road Transportation Act, 1977 (Act 74 of 1977).
- Road Safety Act, 1972 (Act 9 of 1972).
- Road Accident Fund Act, 1972 (Act 9 of 1972).
- Road Traffic Management Corporation Act No 20 of 1999.
- Administrative Adjudication of Road Traffic Offences Act No 46 of 1998.

- Infrastructure Development Act No 23 2014.
- Provincial Infrastructure Delivery Management Framework as approved by the Provincial Executive Council.
- Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended by Acts 181 of 1993 and 66 of 1995 and Regulations.
- National Environmental Management Act, 1998 (Act 107 of 1998) and regulations.
- Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) and regulations.
- Western Cape Road Traffic Act, 1998 (Act 12 of 1998).
- Western Cape Toll Roads Act, 1999 (Act 11 of 1999), and the Policy drawn up in terms of Section 16(1) of the Act.
- Preferential Procurement Policy Framework Act, 2000 (Act 5 of 2000) and its regulations.
- Construction Regulation R1010 of 2003 with specific reference to compliance to occupational health and safety within the construction industry.
- Construction Industry Development Board Act 2000 (Act 38 of 2000) with specific reference to the regulation of the construction industry and its 2004 Regulations with specific reference to the registering of contractors and projects.
- Building Industry Bargaining Council Legislation Act 2003 (Act No 25769 of 2003) with specific reference to the protection of employees in the construction industry.
- Local Government: Municipal Systems Act, 1999 (Act 32 of 1999).
- Local Government: Municipal Structures Act, 1998 (Act 117 of 1998).
- Division of Revenue Act, 2007 (Act 1 of 2007 and subsequent Acts).
- Government Immovable Asset Management Act, 2007 (Act 19 of 2007).
- Expropriation Act, 1975 (Act 63 of 1975).
- Western Cape Transport Infrastructure Act, 2013 (Act 1 of 2013).
- Spatial Land Use Management Act, 2013, (Act 16 of 2013) and regulations.
- The Land-use Planning Ordinance Act, 1985 (No 15 of 1985).
- The Western Cape Land-use Planning Act, 2014.
- The Mine Health and Safety Act, 1996 (No 29 of 1996).

2. Scope

This policy covers the physical assets that comprise the WCG-owned transport infrastructure network and the asset information assets including data, processes and information systems.

The Branch's asset classes covered by this policy include:

- Roads – including earthworks, pavements and surfaces
- Road structures – including bridges (concrete, timber, steel; deck unit, girder/beam, box girder), tunnels, major culverts (box culvert, arch, slab deck, pipe) minor culverts, gantries and tunnels
- Road reserve assets – guard rails, signage, fences, kilometre markers, traffic signals and their controls, intelligent transport systems, etc.
- Non-motorised transport infrastructure – foot paths, etc.
- Information assets that are enablers of asset management.

Asset classes not covered by this policy include:

- Buildings, plant and current assets
- Human resources
- Financial resources

Although human factors such as leadership, motivation and culture are not directly addressed within the scope of this policy, they are critical enablers to successfully achieving optimised and sustainable asset management and require due consideration.

3. Objectives

The objectives of this policy are to set the direction and framework required for road-related asset sustainability, including:

- Meeting legislative requirements for asset management; and
- Ensuring effective resourcing to support asset management.

4. Policy Statement

The Road Network Management Branch (the Branch) of the Department of Transport and Public Works, WCG, will manage the WCG roads assets sustainably over the long term.

The Branch has a strategic role in leading a safe and accessible road transport system that contributes to economic development and enhances the quality of life for all people of the Western Cape. Long-term sustainable asset management is essential to fulfilling this role and delivering cost-effective transport infrastructure and services.

This policy outlines the Branch's approach to asset management and demonstrates how transport investments will be maximised to ensure Western Cape residents receive value-for-money. It will support the Western Cape Government's strategic goals for creating opportunities for growth and jobs, enable a resilient, sustainable, quality and inclusive living environment and embed good governance and integrated service delivery through partnerships and spatial alignment by prioritising investments that facilitate growth and improved productivity. It will foster opportunities for regional development through stakeholder collaboration.

5. Policy Implementation Plan

The Branch aims to meet its policy objectives in terms of:

- Legislative requirements for asset management by
    - Striving to meet excellence in accordance with the draft TMH 22 template (Committee of Transport Officials 2013), which was based on the draft of ISO 55001:2014 Asset management - Management systems – Requirements, which has been adopted without change as SANS 55001:2015 (South African National Standard 2015).
    - Ensure that the WCG road-related assets are managed in a sustainable manner, with appropriate Levels of Service that balance the needs of customers and the environment within available funding and consistent with the Department's risk framework.
    - Safeguard the WCG road-related assets and employees by implementing effective asset management strategies and providing the necessary financial resources for those assets
    - Maximise value-for-money, taking into account the full costs of providing, holding, using, maintaining and disposing of assets throughout their lifecycle
    - Optimise the solutions through improved management and economies of scale

- Demonstrate transparent and responsible asset management processes that align with established best practice.

- To ensure effective resourcing by
    - Ensure resources required and operational capabilities are identified and responsibility for asset management is allocated.
    - Assign clear responsibilities and accountabilities for the stewardship and control of the Branch's road-related assets and the associated reporting responsibilities.

5. Approval

This policy has been approved by Head of Branch.

DATE: 29/3/2018

6. References

References include, but are not limited to:

- Asset Management, SANS 55001:2015: 2014 Edition 1 – Asset Management, SABS, Pretoria, 2014
- Draft TMH 22: Road Asset Management Manual, COTO, SANRAL, Pretoria, 2013
- Roads Ordinance 19 of 1976, Western Cape Government
- Public Finance Management Act, 1 of 2009
- Government Immovable Asset Management Act, 2007 (Act No. 19 of 2007)

Appendix B – Declaration

Preparation of the Road Asset Management Plan

This RAMP was updated by a team comprising of staff and consultants:

Branch staff

- A November Pr. Eng. BSc Eng. (Hons) (UCT)
- H Uys Pr. Tech. Eng. BSc (Hons) Civil Eng. (UP), BTech. Civil Eng. (CUT), NDip. Civil Eng. (CUT)
- H Coetzee Pr. Eng. BSc Eng. (SU)
- M Hofmeyr Pr. Eng. M.Eng. (SU)
- W Moolman Pr. Eng. (SU)

Consultants

- **Aurecon**: M van Wyngaardt Pr. Eng. B. Eng. (Industrial) Hons (Industrial) University of Pretoria
- **IX Engineers:** Riaan Burger Pr. Eng. M. Eng.

The completion of this RAMP is attributed to the foundation set by the authors of the preceded RAMPs.

The following technical consultants assisted in the collection of specific data sets that were required in the compilation of the RAMP:

Table B.1: The names of the officials and technical consultants that collected each of the data sets

Data set	Name of collecting official or technical consultant	
Visual evaluation of paved road network	NEXTEC	Cape Winelands & CoCT
	Mott MacDonald	Overberg
	Hatch Africa	Garden Route
	Gibb	Central Karoo
	Mariswe	West Coast
	Aurecon	Quality Control
Visual evaluation of unpaved road network	AECOM	Cape Winelands
	NAKO	Overberg
	Royal HaskoningDHV	Garden Route
	IX Engineers	Central Karoo
	JG Afrika	West Coast
	Mott MacDonald	Quality Control
Mechanical measurements – longitudinal and transverse profiles, surface texture	Specialised Road Technologies	
Mechanical measurements – Falling Weight Deflectometer deflection measurements	Specialised Road Technologies	
Road Inventory and Lesser and Major Culvers Data collection	NEXTEC (EOH)	Cape Winelands & CoCT
	BVi	Overberg
	SMEC	Garden Route
	Element	Central Karoo
	JG Afrika	West Coast

Table B.1: The names of the officials and technical consultants that collected each of the data sets	
Data set	**Name of collecting official or technical consultant**
Visual evaluation of structures and bridges on the road network	Mott MacDonald
	Bergstan
	WSP
	Nadeson
	Ingerop South Africa
	Nako
	Mariswe
	SNA
	SMEC
	Royal HaskoningDHV
	JG Afrika
	IX Engineers
	HHO Africa
	Hatch Africa
	Gibb
	BVi
	Aurecon
	Aecom
	Element

Age of asset data

In the provided below the year of the data collection and extent of data collected is shown. The age of the data are as follows.

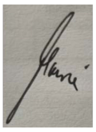
- Visual assessment data for paved and unpaved roads age is current with 100% of the 2019 managed network having data available.
- Longitudinal and transverse profiles, surface texture measurement are 5 years old, new data collections are planned. 93% of the 2019 managed network has data.
- Falling Weight Deflectometer deflection measurements are 5 years old, new data collections are planned. 93% of the 2019 managed network has data.
- Bridge visuals assessments has been complete in 2020, the data is current and undergoing quality assurance process currently.

Table B.2: The extent data collected and year of collection			
Data set	**Road Class**	**Length/Number of structures**	**Year of Data Collection**
Visual evaluation of paved road network	1	235,78	2019
	2	2778,56	2019
	3	2755,94	2019
	4	1203,21	2019
	5	89,48	2019
Visual evaluation of unpaved road network	1	0	2019
	2	131,24	2019
	3	1741,11	2019
	4	8119	2019
	5	359,27	2019
Mechanical measurements – longitudinal and transverse profiles, surface texture	1	228,2	2016
	2	2763,86	2016
	3	2408,36	2016
	4	1152,43	2016
	5	44,08	2016
Mechanical measurements – Falling Weight Deflectometer deflection measurements	Total Length	6596,93	2016
Visual evaluation of structures and bridges on the road network	Bridge	785	2020
	Bridge - Arch	16	2020
	Bridge Cellular	59	2020
	Culvert Major	1768	2020
	Retaining Wall	79	2020
	Sign Gantry	30	2020

Declarations

The Branch declares:

- that the "Road Asset Management Policy" provided in Appendix A was approved on 29 March 2018.
- The Branch is implementing within a Level II RAMS for the road and structure assets.
- that the completeness and the maximum age of data in each of the data sets comply with draft TMH 22 (Committee of Transport Officials, 2013) (inventory data, asset condition data (visual and surveillance), asset usage data, asset valuation data) unless otherwise indicated.
- that the Road Network Management System at https://rnis.westerncape.gov.za is the Branch's register of assets. The inventory is kept up to date as funds allow.
- that the road classification in terms of TRH 26 (Committee of Transport Officials, 2012) was completed.



LG FOURIE Pr Eng, FSAICE
Deputy Director General: Roads Branch

Date: 29 March 2022

Appendix C – Gap Analysis of Asset Management Maturity

Road asset management level and scope of assets included

The current road asset management levels being practised by the Branch are listed in Table C.1 and Table C.2. The coloured blocks indicate the approximate level of maturity. This maturity assessment is based on the framework in draft TMH 22: Road asset management manual (draft) (Committee of Transport Officials 2013), described below:

Initiative – At this stage the people in the organisation are aware of potential asset management benefits and the need for consistent and good quality data. Certain individuals will take initiative to start applying the Road Asset Management System (RAMS) and start to make improvements to see how it can be adapted to meet the developing needs of the organisation. The sustainability of the RAMS will often rely on heroic efforts of individuals.

Proficient – at this level, the RAMS can be described as being embedded within the organisation and is a competent system with everyone having faith in the quality of the data and the related processes and outputs. The system will be able to be used to respond to most questions in respect of road asset inventory, condition, value and the probable quantum of funding required for maintaining the assets to required conditions.

Advanced – in this stage the RAMS will be used and improved regularly, and all data collection and analysis systems will be regarded as routine within the organisation and among all staff. A RAMS of this stage of maturity can be used to directly influence the road authority's programme and work methods and to provide guidelines for maintenance standards, designs and procurement and specifications.

Excellence – at this stage all RAMS policies, process and procedures will routinely be improved to respond to ever more challenging questions at increasing levels of detail, to improve the outputs wherever these are inaccurate, and to ensure a high level of successful and cost-effective performance for all money that is invested in the assets.

Limitations: The survey of the road asset management maturity was prepared by an external assessor in February 2019.

Table C.1: Road asset management levels being practised by the Branch as at March 2019				
Section	**Initiative - Level 1**	**Proficient - Level 2**	**Advanced - Level 3**	**Excellence - Level 4**
Policy	Expectations set in vision and mission statements	Defined policy statements for service levels and minimum conditions	Regular review of achievements and adjustment of policy statements to reflect intent together with short-term objectives and related action plans	Policy statements and strategies integrated into all business processes and regular review
Inventory	Detailed listing of all roads	Integrated GIS and road and bridge inventory together with engineering details of each link	Road asset divided into components with different expected useful life together with construction details	Inventory seamlessly integrated with planned roads, asset register, all acquisition data, and related information material to performance
Valuation	Valuations per km or m^2 of each road type	Valuations per m^2 of road type adjusted for expected useful life	Valuation per component adjusted with estimates of remaining useful life and estimates of unit costs.	Valuation per component reliably adjusted for remaining useful life and unit costs based on detailed statistics of current construction costs
Condition and usage	Visual evaluations of condition of each road. Traffic counts at selected positions	Detailed, objective visual evaluations of each road with some instrument measurements. Traffic counts cover entire road network regularly	Integrated visual and instrument evaluations taken at the minimum frequencies defined in Chapter 3. Traffic count histories to reliably project future volumes	Reliable and credible condition and usage data that is used to accurately determine excess user costs and predict future excess user costs and related risks
Decision support	Judgement of future condition and departmental priorities	Decisions based on reliable strategies and rankings based on condition and importance	Optimisation used to adapt strategies and improve returns on rehabilitation expenditure	Optimisation based on reliable performance predictions and linked to confirmation of performance based on past history
Management plans	Minimal information on planned service levels and future expenditure forecasts	Impacts of plans shown in terms of future service levels with basic information on expenditure forecasting	Plans demonstrate achievement of objectives and likely service levels subject to budget constraints	Fully integrated with customer expectations of service levels and comprehensive risk analysis and trade-offs related to budget constraints
Feedback loop	Anecdotal feedback of performance of actions	Performance of actions measured as part of ongoing condition evaluation and linked to strategy	Specifically planned activities implemented to assess performance and risk and to feed into prediction models and tactics	Regular measured performance of all actions integrated into prediction models and planned actions

Table C.2: Structures assets: bridges, large culverts, retaining walls at March 2019				
Section	**Initiative - Level 1**	**Proficient - Level 2**	**Advanced - Level 3**	**Excellence - Level 4**
Policy	Expectations set in vision and mission statements	Defined policy statements for service levels and minimum conditions	Regular review of achievements and adjustment of policy statements to reflect intent together with short-term objectives and related action plans	Policy statements and strategies integrated into all business processes and regularly reviewed
Inventory	Detailed listing of all structures	Integrated GIS and road and bridge inventory together with engineering details of each link	Structures assets divided into components with different expected useful lives together with construction details	Inventory seamlessly integrated with planned roads, asset register, all acquisition data and related information material to performance
Valuation	Valuations per structure	Valuations structure adjusted for expected useful life	Valuation per component adjusted with estimates of remaining useful life and estimates of unit costs	Valuation per component reliably adjusted for remaining useful life and unit costs based on detailed statistics of current construction costs
Condition and usage	Visual evaluations of condition of each bridge, large culvert and retaining wall	Detailed, objective visual evaluations of each bridge, large culvert and retaining wall with some instrument measurements	Integrated visual and instrument evaluations taken at the minimum frequencies defined in Chapter 3	Reliable and credible condition and usage data to predict risks
Decision support	Judgement of future condition and departmental priorities	Decisions based on reliable strategies and rankings based on condition and importance	Optimisation used to adapt strategies and improve returns on rehabilitation expenditure	Optimisation based on reliable performance predictions and linked to confirmation of performance based on past history
Management plans	Minimal information on planned service levels and future expenditure forecasts	Impacts of plans shown in terms of future service levels with basic information on expenditure forecasting	Plans demonstrate achievement of objectives and likely service levels subject to budget constraints	Fully integrated with customer expectations of service levels and comprehensive risk analysis and trade-offs related to budget constraints
Feedback loop	Anecdotal feedback of performance of actions	Performance of actions measured as part of ongoing condition evaluation and linked to strategy	Specifically planned activities implemented to assess performance and risk and to feed into prediction models and tactics	Regular measured performance of all actions integrated into prediction models and planned actions

The self-evaluation assessment in the above tables provides a complete overview of the asset management maturity within the Branch. This assessment indicate that the Branch is implementing within a Level II RAMS for the roads and structure assets. Gaps within the sections named "valuation" and "management plans" for these assets needs improvement for the Branch to fully operate on a Level II RAMS. The Branch will first aim to complete the work required for a Level II RAMS before taking the necessary incremental steps to commence and develop within implementing Level III and higher RAMS for these assets.

Appendix D – Strategic asset management systems

The following major monitoring and reporting information technology systems as shown diagrammatically in Figure 1-8, in Book 1 of the RAMP is described below:

Road Network Information System

RNIS purpose: to manage the road network information of the WCG and to make this information available to the various subsystems within the Branch. The information in the database is updated by periodic surveys of roadside element data as well as various other sources. This system is designed to eliminate the need for the duplication of data and forms the core of the ongoing effort to achieve integration between the various systems of the Branch.

Output: it provides all the reference data required by other systems.

Traffic Counting System

TCS purpose: to provide a repository of traffic counts, analyse the data and provide reports.

Output: The PMS, GRMS, DSC and other systems access the traffic counts in the TCS. It also provides reports on traffic information to other stakeholders.

Pavement Management System

Purpose:

- Keep an in-depth inventory of pavement structures, etc.
- Keep track of how the network is performing through regular surveillance of:
    - Visual condition;
    - Roughness and rutting;
    - Structural capacity; and
    - Surface texture.

Output: the data for the economic analysis. Reports on the condition of each road on the network and information regarding the state of roads for the compilation of the annual report.

Deighton Total Infrastructure Management System

Purpose: dTIMS optimises the overall performance of the road network over time in accordance with policy objectives and within budgetary constraints by:

- A lifecycle benefit cost economic analysis to optimise the treatments over the lifecycle of the roads for the combined paved and unpaved networks including:
    - Upgrades to paved roads;
    - Rehabilitation of paved roads;
    - Resealing of paved roads;
    - Regravelling of unpaved roads;
    - Upgrades of unpaved roads to paved standards;
    - Bridges and major culverts;
    - Safety upgrades; and

Output: information on the optimal resource allocation, i.e. the optimal split of funds between treatments, such as rehabilitation, resealing, upgrading to paved standards, unpaved road maintenance. An optimised list of rehabilitation and resealing projects for the paved road network.

Highway Development and Management Model

HDM-4 purpose: detailed analysis of the economic feasibility of projects in accordance with policy objectives including:

- New roads;
- Upgrading of paved roads;
- Upgrading of unpaved roads to paved standards;
- Safety projects; and
- Rehabilitation options.

It is envisaged that the benefits and costs of these projects will be input to dTIMS for network optimisation of all projects.

Gravel Road Management System

GRMS purpose: to:

- Keep an inventory of gravel wearing course and subgrade properties
- Keep track of how the network is performing through regular surveillance of visual condition
- Identify and prioritise unpaved roads maintenance projects.

Output: reports on the condition of each unpaved road on the network; information regarding the state of roads for the compilation of the annual report.

Bridge and Structures Management System (B&SMS)

B&SMS purpose: to record the information on the condition and required maintenance on the about all bridges and major culverts on provincial roads.

Output: A prioritised list of bridges and major culverts needing maintenance, rehabilitation or replacement.

Integrated Provincial Accident System (IPAS)

IPAS purpose:

- To capture accident information from the accident report forms;
- To transfer accident information into a provincial accident database that will contain all accident information for the urban and rural networks of the Western Cape.

Output: Provide various reports on accidents and the spatial representation of accidents

Geographical Information System (GIS)

GIS purpose: to provide the Branch with a tool for creating maps from queries of all Roads Infrastructure databases and provide spatial analysis capability.

Outputs: projects in relation to dTIMS priorities; intervention types; routine maintenance activities; distribution of materials sources; overlapping activities.

Appendix E – Tactical and Operational systems

The following major tactical and operational systems as shown diagrammatically in Figure 1-8, in Book 1 of the RAMP is described below:

Integrated Maintenance Management System (IMMS)

IMMS purpose: to keep track of the expenditure at the Regional Offices, the Central Workshop in Bellville and the district municipalities (DMs) which act as agents for the WCG. This information is reconciled with the Basic Accounting System, BAS. This system provides a central database of the information contained in the Maintenance Management Systems as operated by the Regional Offices, District Municipalities and the Bellville Central Workshop.

Output: a database of unit costs and project costs for various maintenance and construction activities.

Gravel Roads Maintenance Management System – under development

GROMAMAS purpose: to support the scheduling, scoping, materials selection and design, risk register, process and acceptance control and project review for regravelling and to optimise the blading maintenance of the unpaved roads network.

Output: project progress, project scope, specifications and design plans, material sources and mix designs, risks and mitigation measures, quality information, actual costs, and blading programmes.

Plant and Equipment Management System

PEMS purpose: to keep and process information relevant to the road construction plant and equipment owned by the Branch for maintenance purposes.

Output: Maintenance and repair costs, utilisation and other logged data are currently transferred from the Maintenance Management System (MMS).

Regional Operations Activity Plan (ROAP) – under development

The current system of local maintenance planning situated in the districts, which is manual and not integrated with the Branch's electronic information systems, will be enhanced by the implementation of ROAP, an electronic tactical and operations level maintenance management system for the Branch. This new system will assist with the operations and maintenance decision making for individual assets that are not currently covered by the strategic-level systems, e.g., RNIS, PMS, and GRMS. It will also provide vital feedback of information to the strategic-level systems that will enhance decision making on the scope of rehabilitation and periodic maintenance projects.

ROAP purpose: to provide a comprehensive view of all operational work (including routine, periodic and rehabilitation and upgrading) and support the management of operations by the identification of defects, scheduling and packaging of routine maintenance activities across District Roads Engineer (DRE), DM and contract maintenance for current expenditure and the scoping of work, work packaging, and scheduling of capital projects, including borrow pits.

Output:

- Operational (including maintenance) works programme and work instructions; and
- History of all routine maintenance, including pavement-related routine maintenance for consideration during the decision-making process for the scoping of rehabilitation and periodic maintenance projects at both strategic and tactical levels.

Portfolio, Program and Project Management System (Rational Portfolio Management – RPM)

RPM purpose: to assist in the management of the Branch's portfolio of projects and programmes.

Output:

- MTEF implementation plans for the planning, design and construction of projects in the project portfolio;
- Measurement of actual performance/estimation of future performance for each indicator in the Annual Performance Plan for each financial year;
- Actual cash flow/ estimated future cash flow per project, programme and financial year;
- Management and operational reports;
- Inputs to financial statements; and
- Framework for the governance of projects in terms of the Project Procedures Manual.

Materials Information Management System

MIMS purpose: provide the repository for all information relevant to material sources and support the process of application for legalisation of these sources from the Department of Mineral Resources, and the reporting done by the Environmental Control Officer during the mining phase.

Output: information on available sources of gravel; reports on the management of borrow pits.

Pavement Quality Management System (PQMS)

PQMS purpose: Quality assurance during all road construction processes, such as:

- Managing the testing of road building materials in the laboratory and storage of the results;
- Planning and design of seals;
- Pavement design;
- Design of asphalt and cemented layers;
- Acceptance control for all layerworks on construction sites (ABACUS);
- Control during the construction of seals (SealPro); and
- As-built database for all for decision-making on future paved road maintenance projects.

Output:

- Quality data;
- As-built data;
- Information for strategic analysis of performance of the network in terms of the quality of construction and the materials used; and
- Data for analysis by the PMS.

Seal Planning and Design System (SPADS) – In development

This is a module of the PQMS.

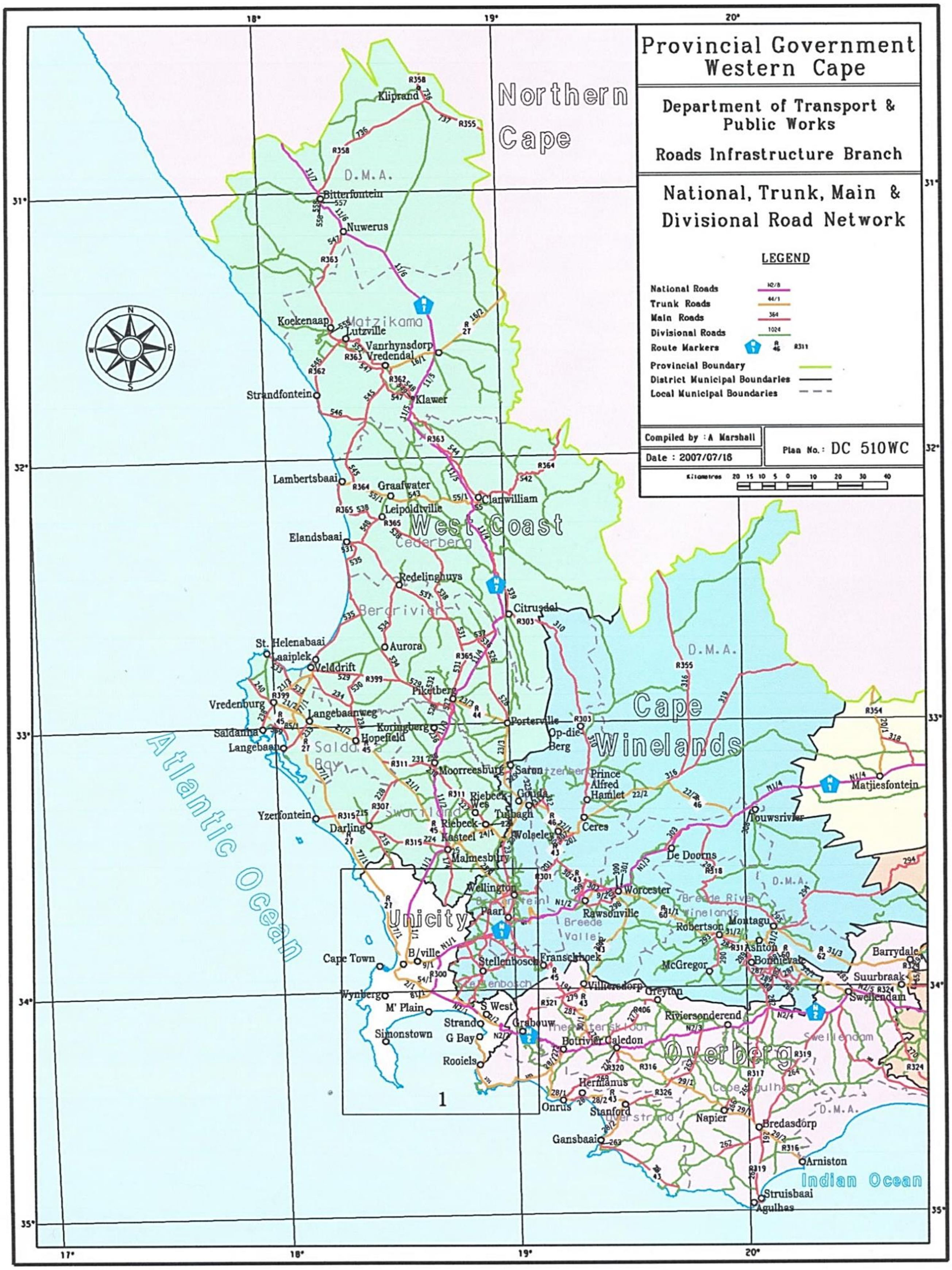
SPADS purpose: to provide the software platform for managing the planning and design of seals in the Western Cape in order to achieve predictable and consistent planning and seal design outputs, both within the Branch and from consulting engineers, while allowing future improvements and innovations.

Output:

- Planned seal types and where they will be applied;
- Report for tender documentation;
- Uniform sections for the seal design; and
- A design reports.

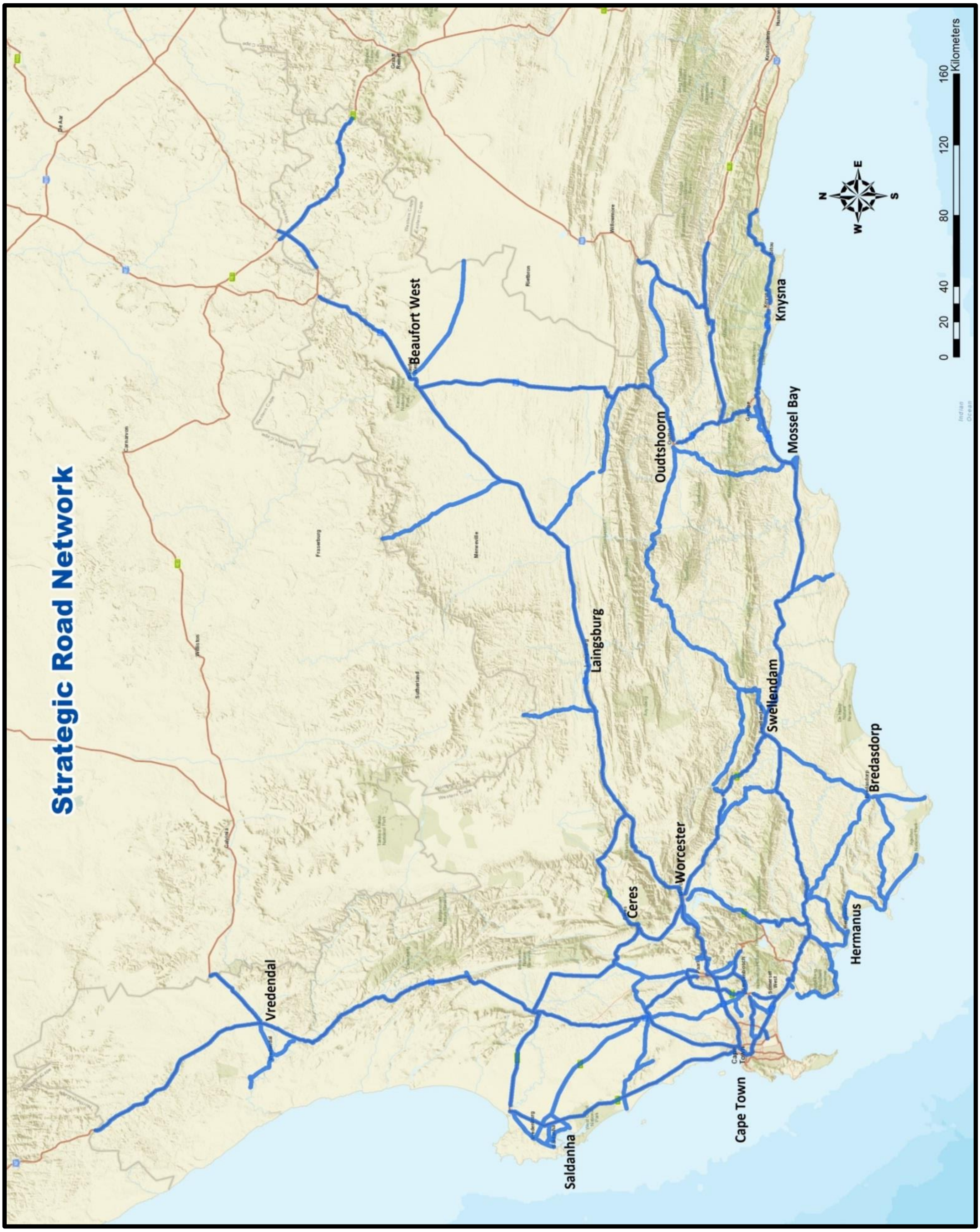
Appendix F – Maps of the road network

Maps obtained in Appendix D were obtained in March 2019.




Provincial Government - Western Cape
Department of Transport & Public Works
Roads Infrastructure Branch
National, Trunk, Main & Divisional Road Network
LEGEND
National Roads
Trunk Roads
Main Roads
Divisional Roads
Route Markers
Provincial Boundary
District Municipal Boundaries
Local Municipal Boundaries
Compiled by : A Marshall
Date : 2007/07/16
Kilometres
Plan No. :
DC 510WC
Northern Cape
Central Karoo
Eastern Cape
Eden
Beaufort West
Murraysburg
Merweville
Leeuw Gamka
Bitter Water
Laingsburg
Prince Albert Road
Prince Albert
Klaarstroom
Cango Caves
Ladismith
Calitzdorp
Oudtshoorn
De Rust
Uniondale
Van Wyksdorp
Brandrivier
Herbertsdale
Heidelberg
Riversdale
Albertinia
Mossel Bay
George
Sedgefield
Knysna
Plettenbergbaai
Gouritsmond
Stilbaai
Witsand
Cape Infanta
Groot Brakrivier
Klein Brakrivier
Indian Ocean
INSET 2

The Strategic Road Network



Appendix G – Development of a new objective function

The Branch is currently developing an "augmented" area-under-the-benefit-curve (AAUC) objective function, to support the current Life-Cycle-Benefit-Cost-Analysis (LCBCA) in addressing the Brach's two strategic objectives:

1. Sustainable asset preservation.
2. Economic growth through road-based transport infrastructure investment.

The area-under-the-condition-curve (AUC) approach has a shortcoming with respect to the Branch's second strategic objective of supporting sustainable economic growth (Western Cape Government 2015). The AUC objective function considers the economic benefits relative to costs incurred for each treatment alternative per road section, but does not consider the broader economic context of where the road segment is located relative to other competing road segments. Refer to Figure E-1that illustrates the AUC pictorially.

.

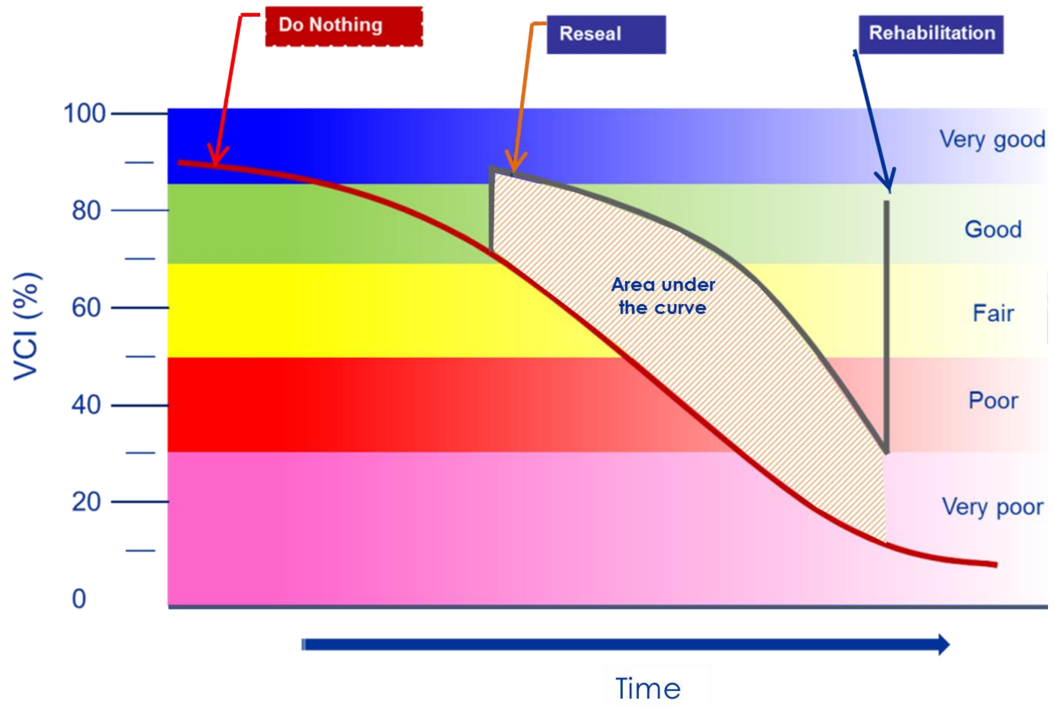


Figure E-1: Illustration of area-under-the-condition curve

The Branch further requires that resource allocation with respect to the road network should be aligned and responsive to the WCG planning themes that are captured in the Provincial Spatial Development Framework (Western Cape Government 2014) and related Growth Potential Study (Western Cape Government 2013). The Branch plans to introduce consideration with respect to the economically equitable allocation of resources during the resource optimisation of the network management process.

Economic consideration can be introduced through augmenting the weighting parameter of the AUC objective function. The premise of this approach is that the road network, in conjunction with other sets of public and private infrastructure, serves to "host" economic activity in a region.

Following on from this assumption, the specific economic weight that each road, road section, or road segment hosts, can be calculated. The economic weight of a road in a specific area is proportioned according to its contribution in terms of vehicle-kilometre (annual average daily traffic [AADT]-km) of the segment in question to that of the total network in the region. The implicit assumption is that a truck and a passenger vehicle carry equivalent economic weight.

Such economic weight per road segment reflects the underlying distribution of activity in an area and between areas. Within the Western Cape, the economic weight could be determined at either local or district municipality level. The premise of the approach introduces equity consideration in the resource allocation process (Porras, Han and Zhang 2014). The proposed approach further shares similarities with the Economic Network Plan approach which matches the economic need, from land use, to the economic flows resulting on the road network (Maughan 2013).

Augmenting the objective function introduces two sources of variation:

- Introduction of vehicle-kilometres enables competition between road links of different lengths and traffic volumes. A short segment with high traffic is competing for investment on the same basis of comparison with a longer segment which hosts lower traffic volumes. The effect is that road sections are weighted by the extent that they perform in hosting the economy. Introducing this step is required as road segment lengths vary considerably.
- Introduction of economic weight of different sub-areas that constitute the area under consideration allows for the reflection of the underlying distribution of actual economic activity. It allows for the equitable allocation of resources according to the quantum of economy hosted.

The nature of the objective function does not change. It remains the sum over the analysis period of changes in the condition, multiplied by a weighting parameter. The weighting parameter itself is augmented to better reflect the underlying economic characteristics. The basis of this weighting parameter remains the level of traffic on the road segment.

The effect of the change of weighting parameter is the re-ranking of priority, irrespective of the benefit part of the function. Given the changes in condition, the benefit part of the equation remains constant.

The approach allows for the alignment and responsiveness of pavement network management with respect to the social and economic development policy. Differential economic growth rates could be assigned to sub-areas where development and growth are anticipated or encouraged in the planning and evaluation timeframe. Such integrated planning would serve to unlock network constraints in timely fashion and support economic growth and development.

Procedure

For each intervention strategy (treatment), the benefit calculated for each year in the analysis period, is weighted by the economic number based on the gross domestic product and not only traffic (AADT). This benefit is then totalled for the analysis period. The "benefit" is the area between the two curves, weighted by the "economic weight". Any repair strategy (consisting of one or more successive treatments) that improves the condition of the road segment would thus result in a positive area above the "do-nothing" curve. During the optimisation analysis, the incremental benefit of alternative intervention strategies with increasing costs is measured in terms of the AUC curve.

The AAUC objective function is calculated by summing the present value of the difference between the condition index resulting from the intervention strategy (a combination of intervention activities over the analysis period) and the condition index for the do-nothing alternative, for each year in the analysis period. The AAUC curve benefit calculations are weighted by the "economic weight".

The equation to calculate this benefit for an intervention strategy on a road segment is:

$$Benefit = \sum_{\forall j,i} \left\{ \left(\frac{AADT_j \times km_j}{\sum_{\forall j} AADT_j \times km_j} \right) Econ_j \right\} (IS_{Cond} - DN_{Cond})$$

Where:

Benefit = Benefit of an Intervention Strategy for a road segment
AADTj = AADT on the road segment j

km_j = Length of road segment j
$Econ_i$ = Size of economy in terms of the gross domestic product in sub-area i
j = Road segment
i = Sub-area in the evaluation area
IS_{Cond} = Condition of the road segment for the Intervention Strategy in year n
DN_{Cond} = Condition of the road segment for the Do Nothing Strategy in year n

Limitation: the degree of granularity achieved is at the level of a local municipality and not at road level.

This aspect needs further investigation to determine if the granularity can be improved to road level.

Assumption: a heavy vehicle and a passenger vehicle carry equivalent economic weight.

This aspect needs to be researched further to find out whether it is possible to determine the economic value of heavy vehicles and passenger vehicles on any road in order to refine the quantifiable economic value hosted by every road in the network. The economic value of the light vehicle traffic is not expected to have a large variation, but the economic value of the heavy vehicles could vary considerably, depending on the value of the goods being transported.

The approach could also be expanded to allow for vehicle-passenger-kilometres, introducing social consideration through average occupancy levels. This would introduce more variation only in the event that occupancy levels differ significantly between the sub-areas constituting the area under evaluation.

Evaluation

The Branch plans to review the effect of the AAUC objective function by comparing results with those yielded by the objective function used in the 2019/20 analysis. Any major changes to the LCBCA will only be done upon a multiple year comparison which is documented in a report and presented to the Branch for approval.

Appendix H - Benchmarking

Benchmarking is a valuable tool to measure the current performance of assets, to provide an effective mechanism to predict the impact of investments on these assets and to provide the custodians of assets with goals to pursue, thereby ensuring continuous performance of such assets.

Two performance indicators are currently used in South Africa to describe the overall condition of a road network. These are:

- Average visual condition index (VCI) weighted for the length of each road segment, and
- Network condition number (NCN) weighted for both the length and the condition of each road segment.

For benchmarking, the averaged network VCI is not suitable because the effect of poorer roads could be concealed by a similar proportion of good to very good roads. On the other hand, the NCN has a high sensitivity for changes and occurrence of roads in the poor to very poor condition categories, thus making it a suitable performance indicator (PI) for use when determining benchmarking for road networks.

Benchmarking for surfaced and unsurfaced road networks will also differ because the level of functionality, such as roughness, that is expected and achievable is different. Traffic on the road network, and therefore road users that are affected by road condition also plays a role in determining realistic goals. No guidelines are currently adopted for South Africa, but an observation of the Department of Transport in the document *Road Infrastructure Strategic Framework for South Africa*, July 2005 reads as follows:

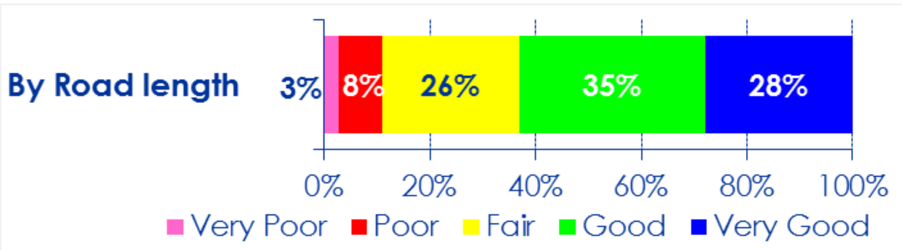
"Internationally the benchmark of road quality is that no more than 5 to 10 per cent of the road networks be in a poor to very poor state (according to the VCI key performance indicator) for a limited period before remedial action is executed. It is recommended that this benchmark be interrogated in the South African context and a decision be made on an appropriate benchmark for the road network."

A further benchmark to pursue is to ensure the need for preventive maintenance can be accomplished. Preventive maintenance, such as the resealing of surfaced roads, is a cost-effective intervention measure with considerable long-term preservation effects. The opportunity for such preventive measures exists typically with surfaced roads in the fair condition category before they deteriorate to a state where expensive rehabilitation intervention remains the only alternative. This benchmarking measure is therefore to limit the proportion of fair roads and thereby retarding their deterioration to a poor condition. Note that this does not mean that roads in good and very good condition do not qualify for preventive maintenance treatments.

In order to choose suitable benchmarking values for the Branch, the 2013 condition data of the surfaced and unsurfaced road networks were investigated and compared to international standards for poor and very poor roads, and other opinions in the industry.

The current condition of the surfaced road network

The 2013 VCI for WCG's surfaced roads is 72% and the 2013 NCN is 66%. The proportions of the surfaced road network in the five condition categories are shown in the graph below.

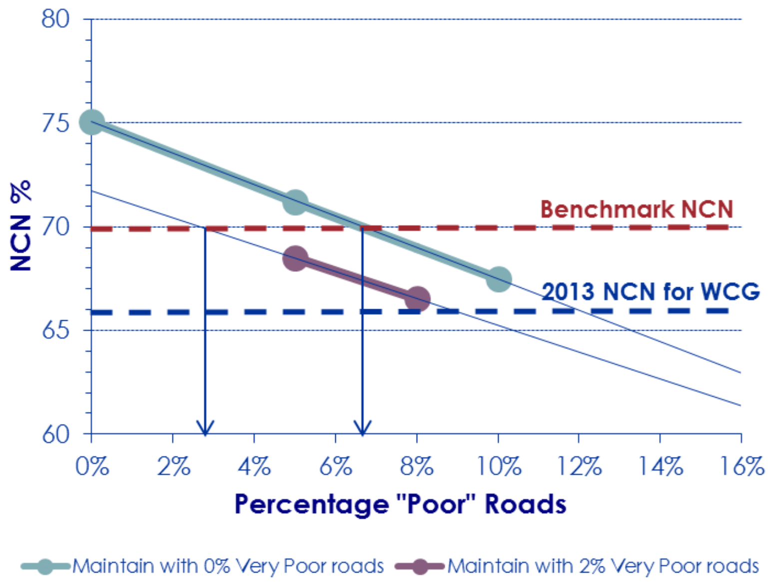


Benchmarking of the surfaced road network

The 2013 condition data of the WCG was used to determine benchmarks for surfaced roads. A combination of condition distribution scenarios was investigated to derive at a benchmark NCN and distribution ceiling values for VCI. These are as follows:

- Very Poor roads - two scenarios were investigated:
  - No very poor roads, and
  - 2% very poor roads.
- Poor roads – A variety of proportions ranging between 0% and 10% of surfaced roads in this condition category.
- The above proportions are therefore adhering to the international benchmarking for road condition keeping no more than 5 to 10 per cent of roads in the poor to very poor category.
- Fair roads – this proportion was kept at 26% thus adhering to a benchmark where approximately 25% of surfaced roads should be in a fair condition and ensuring the need for resealing does not escalate beyond an achievable/realistic level.

The figure below shows the condition impact graphs generated from the 2013 condition data and for the combination of condition scenarios described above.



Condition impact graphs for paved roads

Reading from the graph, a benchmark NCN of 70% was selected as a sensible PI, thus ensuring the condition of surfaced roads remains between the following threshold scenarios:

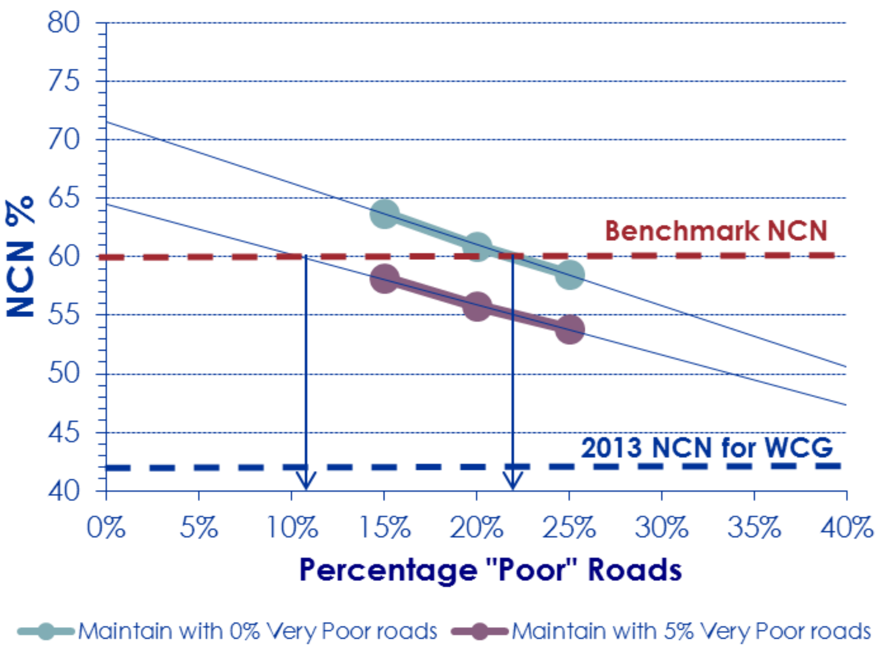
Scenario with no very poor roads
• Less than 7% Poor roads and • Less than 25% Fair roads
Scenario allowing a maximum of 2% very poor roads
• Less than 3% Poor roads and • Less than 25% Fair roads

Benchmarking of the unsurfaced road network

As for surfaced roads, the most recent condition data of unsurfaced roads was used for benchmarking the condition of unsurfaced roads. A combination of condition distribution scenarios was investigated to derive at a benchmark NCN and distribution ceilings for VCI. These are as follows:

- Very Poor roads - two scenarios were investigated:
  - No very poor roads, and
  - 5% very poor roads.
- Poor roads – proportions ranging between 15% and 25% of unsurfaced roads in this condition category.
- The above proportions are much higher than the international benchmarking of 5 to 10 per cent, but due to the current state of unsurfaced roads in the Western Cape and South Africa, a realistic benchmark is proposed in the short-term. The benchmark was investigated for a proportion of poor to very poor roads of no more than 20 to 30 per cent. This benchmark could be revised once guidelines are provided for the maintenance of unsurfaced roads according to functional class and for the environmental difficulties in finding appropriate burrow pits for supply of gravel wearing course material.
- The higher ceiling for poor /very poor roads is also a result of the trade-off between maintenance funding and the magnitude of road users affected by the investment. The traffic on unsurfaced roads constitutes only 4% of all vehicle-km driven on the Western Cape's provincial roads.
- Fair roads – this proportion was kept at 32% thus assuming plus-minus one third of the unsurfaced road network would remain in a fair condition.

The figure below shows the condition impact graphs generated from the most recent condition data and for the combination of condition scenarios described above.



Condition impact graphs for unpaved roads

Condition impact graphs for unsurfaced roads

Reading from the graph, a benchmark NCN of 60% was selected as a sensible PI, thus ensuring the condition of unsurfaced roads remains between the following threshold scenarios:

Scenario with no very poor roads

- Less than 22% Poor roads and
- Maintain the proportion of Fair roads at one-third of the unsurfaced road length

Scenario allowing a maximum of 5% very poor roads

- Less than 10% Poor roads and
- Maintain the proportion of Fair roads at one-third of the unsurfaced road length

Appendix I – Calibration factors for modelling performance

Table I.1 shows the calibration factors for HDM-4 models (HDM-4 Calibration study for Western Cape Government, 02 July 2013) compared to the factors from previous years. These factors are derived from the continuous monitoring of specific pavement performance monitoring sections in the Western Cape Province.

The calibration factors influence the performance models as follows:

- Crack initiation: The period starting at the most recent re/surfacing up to the time when the first signs of cracks are visible.
- Crack progression: The rate at which cracks progress from the time of crack initiation and onwards.
- Ravelling initiation: The period starting at the most recent re/surfacing up to the time when the first signs of ravelling (aggregate loss) are visible.
- Ravelling progression: The rate at which ravelling progress from the time of ravelling initiation and onwards.
- Pothole progression: The rate at which potholes progress from the time of pothole initiation and onwards.
- Roughness progression: The rate at which roughness progresses (deteriorates).
- Rut depth progression: The rate at which rut depth progresses (deteriorates).

Table I.1: Pavement performance calibration factors for paved roads for HDM-4 models

Distress parameter		Seal type	Recommended calibration factor
Time to all crack initiation (ICA)	K_{cia}	Sand seals (SS) and Diluted emulsions (DE)	0,7
		Cape seals (S19)	0,7
		Latex modified seals (L13G)	0,7
		Conventional seals and all other seals not mentioned above	1,2
		Asphalt surfaces	2,5
Time to wide crack initiation (ICW)	K_{ciw}	All types	1,0
All crack progression (ACA)	K_{cpa}	All types, but Cape Seals	0,12
		Cape Seals	An alternative model is recommended where all cracking develop to 20% in the first year after crack initiation, thereafter a 10% increase in all cracking annually.
Wide crack progression (ACW)	K_{cpw}	All types	0,14
Time to ravelling initiation (IRV)	K_{vi}	Diluted emulsions	0,7
		Cape seals	1,3
		Conventional seals and all other seals not mentioned above	1,0
		Asphalt surfaces	1,7
Ravelling progression (ARV)	K_{vp}	All types	1,0
Pothole initiation (IPT)	K_{pi}	All types	1,0
Pothole progression (NPT)	K_{pp}	All types	1,0

Table I.1: Pavement performance calibration factors for paved roads for HDM-4 models			
Distress parameter		**Seal type**	**Recommended calibration factor**
Rutting initial densification (RDO)	K_{rid}	All types	1,0
Rutting progression (RDST)	K_{rst}	All types	3,1
Roughness progression (RI)	K_{gs}	All types	1,0
Roughness progression (RI)	K_{gm}	All types	2,8

The Branch continues to collect information on calibration factors for HDM-4 models from the continuous monitoring of specific pavement performance monitoring sections in the Western Cape Province.

Appendix J – Standards and Specifications

- The Geometric Design Manual of the Provincial Administration: Western Cape
- TRH 17: Geometric Design of Rural Roads, 1984.
- South African Road Safety Manual
- Road Access Guidelines, Transport Infrastructure Branch, as amended from time to time.
- 'Handleiding vir padboumetodes', PGWC, as amended from time to time.
- Materials Manual: Provincial Administration of the Western Cape, as amended from time to time.
- Maintenance Manual – Provincial Administration of the Cape of Good Hope, July 1986.
- TRH 14: Guidelines for road construction materials
- Draft TRH3: Surfacing seals for rural and urban roads
- TMH1: Standard methods of testing road construction materials
- TMH5: Sampling methods for road construction materials
- TRH9: Construction of road embankments
- TRH10: The design of road embankments
- Draft TRH15: Sub-surface drainage for roads
- Draft TRH18: The investigation, design, construction and maintenance of road cuttings.
- SADC Road Traffic Signs Manual
- TMH7: Code of practice for the design of highway bridges, and culverts in South Africa, parts 1 to 3.
- Bridge Design Manual : Provincial Administration Western Cape
- TRH25: Guidelines for the Hydraulic design and maintenance of river crossings
- General conditions of contract for State Road Authorities (CSAICE) 2004.
- Standard specifications: COLTO (1998)
- Project procedures manual, Volumes 1 to 3. PGWC As amended.
- K21 (revised) Identification and improvement of hazardous locations. CSIR. 1991.
- TRH20: The structural design, construction and maintenance of unpaved roads. 1990.
- Guidelines for the provision and maintenance of unpaved roads in the Western Cape, 2005.
- Draft TRH 4: Structural design of flexible pavements for interurban and rural roads. 1996
- TRH 12: Flexible pavement rehabilitation investigation and design. 1997.
- Draft TRH 3: Surfacing seals for rural and urban roads. 1998.

Appendix K – Forward Works Program and alignment of projects

Optimised delivery schedule per financial year

The report shows the correlation between dTIMS Candidate Projects and the current project schedule in terms of delivering on the identified dTIMS priorities per financial year.

Key:

Not scheduled (red) | Late delivery (yellow) | Early delivery (green)

Priority A: Recommended Treatment now if funds are available

Priority B: Recommended Treatment next year

Priority C: Recommended Treatment in the future

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2022	Priority A	Reseal	DR01119	4,66	7,27	(blank)	None	0,00	0,00	2,61
2022	Priority A	Reseal	DR01254	0,00	12,29	(blank)	None	0,00	0,00	12,29
2022	Priority A	Reseal	DR01295	0,37	2,69	2021	Reseal	0,37	2,69	2,32
2022	Priority A	Reseal	DR01342	14,00	18,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Reseal	DR01359	0,00	3,00	(blank)	None	0,00	0,00	3,00
2022	Priority A	Reseal	DR01363	0,00	2,84	2024	Reseal	0,00	2,84	2,84
2022	Priority A	Reseal	DR01368	0,00	2,00	2019	Reseal	0,00	3,35	2,00
2022	Priority A	Reseal	DR01368	2,00	3,35	2019	Reseal	0,00	3,35	1,35
2022	Priority A	Reseal	DR01386	0,00	4,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Reseal	DR01390	0,00	4,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Reseal	DR01390	4,00	6,93	(blank)	None	0,00	0,00	2,93
2022	Priority A	Reseal	DR01398	14,00	22,00	(blank)	None	0,00	0,00	8,00
2022	Priority A	Reseal	DR01400	0,00	6,00	2024	Reseal	0,00	8,23	6,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2022	Priority A	Reseal	DR01408	1,44	6,37	(blank)	None	0,00	0,00	4,93
2022	Priority A	Reseal	DR01429	0,00	0,25	(blank)	None	0,00	0,00	0,25
2022	Priority A	Reseal	DR01441	0,00	1,93	(blank)	None	0,00	0,00	1,93
2022	Priority A	Reseal	DR01452	4,00	10,00	(blank)	None	0,00	0,00	6,00
2022	Priority A	Reseal	DR01453	0,00	2,38	(blank)	None	0,00	0,00	2,38
2022	Priority A	Reseal	DR01461	0,72	2,00	(blank)	None	0,00	0,00	1,28
2022	Priority A	Reseal	DR01532	0,00	2,00	2021	Reseal	0,00	17,16	2,00
2022	Priority A	Reseal	DR01532	8,00	10,00	2021	Reseal	0,00	17,16	2,00
2022	Priority A	Reseal	DR01532	14,00	17,16	2021	Reseal	0,00	17,16	3,16
2022	Priority A	Reseal	DR01645	0,00	2,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Reseal	DR01671	0,00	2,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Reseal	DR01671	2,00	7,27	(blank)	None	0,00	0,00	5,27
2022	Priority A	Reseal	DR01680	0,00	5,15	(blank)	None	0,00	0,00	5,15
2022	Priority A	Reseal	DR01709	2,00	6,74	(blank)	None	0,00	0,00	4,74
2022	Priority A	Reseal	DR01770	10,00	12,33	(blank)	None	0,00	0,00	2,33
2022	Priority A	Reseal	DR01834	4,00	7,41	(blank)	None	0,00	0,00	3,41
2022	Priority A	Reseal	DR02175	0,00	12,00	(blank)	None	0,00	0,00	12,00
2022	Priority A	Reseal	DR02178	0,00	6,00	(blank)	None	0,00	0,00	6,00
2022	Priority A	Reseal	DR02180	19,90	24,00	(blank)	None	0,00	0,00	4,10
2022	Priority A	Reseal	DR02184	14,00	16,30	(blank)	None	0,00	0,00	2,30
2022	Priority A	Reseal	DR02220	0,00	3,57	2024	Reseal	0,00	3,57	3,57
2022	Priority A	Reseal	DR02221	0,00	2,39	(blank)	None	0,00	0,00	2,39
2022	Priority A	Reseal	MR00028	0,54	24,00	(blank)	None	0,00	0,00	23,46
2022	Priority A	Reseal	MR00174	44,00	46,15	(blank)	None	0,00	0,00	2,15
2022	Priority A	Reseal	MR00188	22,00	24,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Reseal	MR00229	0,00	1,88	(blank)	None	0,00	0,00	1,88

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2022	Priority A	Reseal	MR00262	0,00	2,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Reseal	MR00271	10,00	34,00	(blank)	None	0,00	0,00	24,00
2022	Priority A	Reseal	MR00286	22,72	26,00	(blank)	None	0,00	0,00	3,28
2022	Priority A	Reseal	MR00310	72,00	76,00	2021	Reseal	64,45	84,45	4,00
2022	Priority A	Reseal	MR00310	76,00	78,00	2021	Reseal	64,45	84,45	2,00
2022	Priority A	Reseal	MR00331	1,43	10,54	2024	Reseal	1,43	10,57	9,11
2022	Priority A	Reseal	MR00334	2,00	6,00	2021	Reseal	0,00	26,49	4,00
2022	Priority A	Reseal	MR00334	6,00	8,00	2021	Reseal	0,00	26,49	2,00
2022	Priority A	Reseal	MR00334	8,00	14,00	2021	Reseal	0,00	26,49	6,00
2022	Priority A	Reseal	MR00337	2,00	4,00	2021	Reseal	0,60	15,65	2,00
2022	Priority A	Reseal	MR00532	0,00	5,53	(blank)	None	0,00	0,00	5,53
2022	Priority A	Reseal	MR00546	46,00	50,00	2024	Reseal	37,45	52,80	4,00
2022	Priority A	Reseal	MR00547	66,00	70,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Reseal	MR00552	10,00	12,00	2024	Reseal	0,00	20,00	2,00
2022	Priority A	Reseal	MR00557	0,00	1,36	(blank)	None	0,00	0,00	1,36
2022	Priority A	Reseal	OP04019	0,00	2,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Reseal	OP04068	0,00	4,09	(blank)	None	0,00	0,00	4,09
2022	Priority A	Reseal	OP05223	0,00	1,44	(blank)	None	0,00	0,00	1,44
2022	Priority A	Reseal	OP05255	0,00	1,41	(blank)	None	0,00	0,00	1,41
2022	Priority A	Reseal	OP05362	0,00	1,83	(blank)	None	0,00	0,00	1,83
2022	Priority A	Reseal	OP06456	0,00	0,65	(blank)	None	0,00	0,00	0,65
2022	Priority A	Reseal	TR00101	4,00	14,00	(blank)	None	0,00	0,00	10,00
2022	Priority A	Reseal	TR01609	30,00	32,00	2024	Reseal	0,00	41,42	2,00
2022	Priority A	Reseal	TR02201	24,00	26,00	2023	Reseal	20,60	26,80	2,00
2022	Priority A	Reseal	TR02901	40,00	42,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Reseal	TR03101	8,00	12,00	2024	Reseal	4,54	13,58	4,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2022	Priority A	Light Rehabilitation	DR01098	8,79	14,24	2027	Rehabilitate	8,79	14,24	5,45
2022	Priority A	Light Rehabilitation	DR01118	1,05	6,31	(blank)	None	0,00	0,00	5,26
2022	Priority A	Light Rehabilitation	DR01300	1,37	4,36	(blank)	None	0,00	0,00	2,99
2022	Priority A	Light Rehabilitation	DR01788	0,00	1,46	(blank)	None	0,00	0,00	1,46
2022	Priority A	Light Rehabilitation	MR00199	20,00	22,46	(blank)	None	0,00	0,00	2,46
2022	Priority A	Light Rehabilitation	MR00210	0,06	0,87	(blank)	None	0,00	0,00	0,81
2022	Priority A	Light Rehabilitation	MR00224	2,35	6,00	(blank)	None	0,00	0,00	3,65
2022	Priority A	Light Rehabilitation	MR00306	0,36	0,72	(blank)	None	0,00	0,00	0,36
2022	Priority A	Light Rehabilitation	MR00310	20,00	22,00	2024	Reseal	1,91	22,00	2,00
2022	Priority A	Light Rehabilitation	MR00365	8,00	10,00	2024	Reseal	0,00	14,12	2,00
2022	Priority A	Light Rehabilitation	MR00547	14,00	21,55	(blank)	None	0,00	0,00	7,55
2022	Priority A	Light Rehabilitation	MR00547	23,10	26,00	(blank)	None	0,00	0,00	2,90
2022	Priority A	Light Rehabilitation	MR00547	26,00	30,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Light Rehabilitation	MR00547	30,00	34,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Light Rehabilitation	OP05742	0,00	2,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Light Rehabilitation	TR00102	66,00	70,00	2021	Reseal	51,70	70,80	4,00
2022	Priority A	Light Rehabilitation	TR00202	2,00	6,00	2022	Asphalt Overlay	1,60	7,69	4,00
2022	Priority A	Light Rehabilitation	TR00202	2,00	6,00	2022	Asphalt Overlay	7,69	8,54	4,00
2022	Priority A	Light Rehabilitation	TR00210	54,76	59,15	2022	Reseal	54,66	59,15	4,39
2022	Priority A	Light Rehabilitation	TR00902	6,00	10,00	2022	Reseal	0,21	21,25	4,00
2022	Priority A	Light Rehabilitation	TR02303	20,00	24,00	(blank)	None	0,00	0,00	4,00
2022	Priority A	Light Rehabilitation	TR02501	8,00	10,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Light Rehabilitation	TR02801	10,00	12,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Light Rehabilitation	TR02901	32,00	34,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Light Rehabilitation	TR03002	12,00	14,00	2029	Rehabilitate	12,00	21,50	2,00
2022	Priority A	Light Rehabilitation	TR03002	14,00	16,00	(blank)	None	0,00	0,00	2,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2022	Priority A	Light Rehabilitation	TR03002	14,00	16,00	2029	Rehabilitate	12,00	21,50	2,00
2022	Priority A	Light Rehabilitation	TR03106	18,00	20,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Light Rehabilitation	TR03305	24,00	26,00	2022	Reseal	0,00	110,00	2,00
2022	Priority A	Rehabilitate	MR00027	26,00	31,20	(blank)	None	0,00	0,00	5,20
2022	Priority A	Rehabilitate	MR00199	18,00	20,00	(blank)	None	0,00	0,00	2,00
2022	Priority A	Rehabilitate	MR00205	0,00	6,00	2024	Rehabilitate	0,00	8,62	6,00
2022	Priority A	Rehabilitate	MR00310	1,91	8,00	2024	Reseal	1,91	22,00	6,09
2022	Priority A	Rehabilitate	TR00201	2,00	8,00	2022	Reseal	0,00	13,80	12,00
2022	Priority A	Rehabilitate	TR03106	14,00	18,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	DR01119	3,74	4,59	(blank)	None	0,00	0,00	0,85
2023	Priority B	Reseal	DR01161	0,00	4,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	DR01161	4,00	8,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	DR01162	21,50	22,43	(blank)	None	0,00	0,00	0,93
2023	Priority B	Reseal	DR01170	0,00	3,58	(blank)	None	0,00	0,00	3,58
2023	Priority B	Reseal	DR01342	18,00	20,15	(blank)	None	0,00	0,00	2,15
2023	Priority B	Reseal	DR01372	0,00	6,00	(blank)	None	0,00	0,00	6,00
2023	Priority B	Reseal	DR01420	0,00	0,56	(blank)	None	0,00	0,00	0,56
2023	Priority B	Reseal	DR01440	2,00	4,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	DR01452	2,00	4,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	DR01487	120,00	123,32	2024	Reseal	105,93	123,32	3,32
2023	Priority B	Reseal	DR01549	0,00	1,03	(blank)	None	0,00	0,00	1,03
2023	Priority B	Reseal	DR01573	7,93	9,06	(blank)	None	0,00	0,00	1,13
2023	Priority B	Reseal	DR01645	2,00	4,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	DR01645	4,00	5,40	(blank)	None	0,00	0,00	1,40
2023	Priority B	Reseal	DR01709	0,00	2,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	DR02151	3,02	4,19	(blank)	None	0,00	0,00	1,17

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2023	Priority B	Reseal	DR02180	24,00	35,68	(blank)	None	0,00	0,00	11,68
2023	Priority B	Reseal	DR02191	0,00	0,40	2021	Reseal	0,00	0,40	0,40
2023	Priority B	Reseal	DR02227	0,00	2,82	(blank)	None	0,00	0,00	2,82
2023	Priority B	Reseal	DR02232	0,00	8,00	2021	Reseal	0,00	25,37	8,00
2023	Priority B	Reseal	DR02232	10,00	12,00	2021	Reseal	0,00	25,37	2,00
2023	Priority B	Reseal	DR02232	12,00	18,00	2021	Reseal	0,00	25,37	6,00
2023	Priority B	Reseal	DR02232	18,00	20,00	2021	Reseal	0,00	25,37	2,00
2023	Priority B	Reseal	DR02232	20,00	22,00	2021	Reseal	0,00	25,37	2,00
2023	Priority B	Reseal	DR02232	22,00	24,00	2021	Reseal	0,00	25,37	2,00
2023	Priority B	Reseal	MR00028	24,00	28,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	MR00174	32,00	42,00	(blank)	None	0,00	0,00	10,00
2023	Priority B	Reseal	MR00174	42,00	44,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	MR00177	22,00	24,36	2022	Reseal	19,60	30,15	2,36
2023	Priority B	Reseal	MR00187	8,00	10,00	2027	Reseal	4,72	14,71	2,00
2023	Priority B	Reseal	MR00295	4,00	6,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	MR00310	68,00	72,00	2021	Reseal	64,45	84,45	4,00
2023	Priority B	Reseal	MR00334	16,00	26,49	2021	Reseal	0,00	26,49	10,49
2023	Priority B	Reseal	MR00337	33,21	36,00	2021	Reseal	33,21	48,95	2,79
2023	Priority B	Reseal	MR00337	36,00	38,00	2021	Reseal	33,21	48,95	2,00
2023	Priority B	Reseal	MR00337	38,00	40,00	2021	Reseal	33,21	48,95	2,00
2023	Priority B	Reseal	MR00337	40,00	42,00	2021	Reseal	33,21	48,95	2,00
2023	Priority B	Reseal	MR00337	44,00	46,00	2021	Reseal	33,21	48,95	2,00
2023	Priority B	Reseal	MR00403	4,00	8,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	MR00403	12,00	13,03	(blank)	None	0,00	0,00	1,03
2023	Priority B	Reseal	MR00531	66,00	70,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	MR00547	56,00	66,00	(blank)	None	0,00	0,00	10,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2023	Priority B	Reseal	MR00547	70,00	72,81	(blank)	None	0,00	0,00	2,81
2023	Priority B	Reseal	MR00559	14,00	16,31	(blank)	None	0,00	0,00	2,31
2023	Priority B	Reseal	MR00559	15,83	16,31	(blank)	None	0,00	0,00	0,48
2023	Priority B	Reseal	MR00582	40,00	44,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Reseal	MR00582	44,00	52,00	(blank)	None	0,00	0,00	8,00
2023	Priority B	Reseal	MR00582	52,00	54,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	MR00582	54,00	68,00	(blank)	None	0,00	0,00	14,00
2023	Priority B	Reseal	MR00582	68,00	74,00	(blank)	None	0,00	0,00	6,00
2023	Priority B	Reseal	OP05543	0,00	2,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Reseal	OP06887	1,41	2,41	(blank)	None	0,00	0,00	1,00
2023	Priority B	Reseal	OP08081	0,00	0,29	(blank)	None	0,00	0,00	0,29
2023	Priority B	Reseal	OP08081	1,28	2,82	(blank)	None	0,00	0,00	1,54
2023	Priority B	Reseal	TR08801	68,00	70,20	2021	Reseal	60,34	70,20	2,20
2023	Priority B	Light Rehabilitation	DR01343	0,44	3,10	(blank)	None	0,00	0,00	2,66
2023	Priority B	Light Rehabilitation	DR01373	0,00	0,74	2021	Upgrade	0,00	0,74	0,74
2023	Priority B	Light Rehabilitation	DR01412	0,00	1,71	(blank)	None	0,00	0,00	1,71
2023	Priority B	Light Rehabilitation	DR01416	1,80	4,00	(blank)	None	0,00	0,00	2,20
2023	Priority B	Light Rehabilitation	DR01418	0,00	3,68	(blank)	None	0,00	0,00	3,68
2023	Priority B	Light Rehabilitation	DR01592	0,00	0,32	(blank)	None	0,00	0,00	0,32
2023	Priority B	Light Rehabilitation	DR02183	27,01	27,32	(blank)	None	0,00	0,00	0,31
2023	Priority B	Light Rehabilitation	MR00172	8,00	15,76	(blank)	None	0,00	0,00	7,76
2023	Priority B	Light Rehabilitation	MR00174	0,00	0,60	(blank)	None	0,00	0,00	0,60
2023	Priority B	Light Rehabilitation	MR00174	30,28	32,00	(blank)	None	0,00	0,00	1,72
2023	Priority B	Light Rehabilitation	MR00201	46,10	50,23	(blank)	None	0,00	0,00	4,13
2023	Priority B	Light Rehabilitation	MR00231	0,00	0,03	(blank)	None	0,00	0,00	0,03
2023	Priority B	Light Rehabilitation	MR00261	0,80	2,00	2025	Rehabilitate	0,80	15,00	1,20

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2023	Priority B	Light Rehabilitation	MR00290	0,25	2,00	(blank)	None	0,00	0,00	1,75
2023	Priority B	Light Rehabilitation	MR00305	0,00	1,30	(blank)	None	0,00	0,00	1,30
2023	Priority B	Light Rehabilitation	MR00332	0,00	0,04	(blank)	None	0,00	0,00	0,04
2023	Priority B	Light Rehabilitation	MR00347	3,24	6,00	(blank)	None	0,00	0,00	2,76
2023	Priority B	Light Rehabilitation	MR00347	12,45	16,00	(blank)	None	0,00	0,00	3,55
2023	Priority B	Light Rehabilitation	MR00547	34,00	42,00	(blank)	None	0,00	0,00	8,00
2023	Priority B	Light Rehabilitation	MR00547	42,00	46,00	(blank)	None	0,00	0,00	4,00
2023	Priority B	Light Rehabilitation	OP04232	0,00	0,55	(blank)	None	0,00	0,00	0,55
2023	Priority B	Light Rehabilitation	TR00209	0,00	2,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Light Rehabilitation	TR01602	24,00	25,00	2028	Reseal	7,90	34,85	1,00
2023	Priority B	Light Rehabilitation	TR02801	2,00	4,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Light Rehabilitation	TR02801	28,00	29,46	2026	Reseal	26,69	29,46	2,92
2023	Priority B	Light Rehabilitation	TR03104	56,00	58,00	2022	Reseal	30,80	76,06	2,00
2023	Priority B	Light Rehabilitation	TR03105	36,00	38,00	(blank)	None	0,00	0,00	2,00
2023	Priority B	Light Rehabilitation	TR03305	26,00	28,00	2022	Reseal	0,00	110,00	2,00
2023	Priority B	Light Rehabilitation	TR07701	24,59	26,00	(blank)	None	0,00	0,00	1,41
2023	Priority B	Light Rehabilitation	TR07701	50,00	54,00	2022	Reseal	48,22	71,41	4,00
2023	Priority B	Rehabilitate	MR00303	0,00	0,34	(blank)	None	0,00	0,00	0,34
2023	Priority B	Rehabilitate	TR00901	0,00	8,00	2021	Reseal	0,00	10,84	16,00
2023	Priority B	Rehabilitate	TR00901	8,00	10,81	2021	Reseal	0,00	10,84	5,62
2023	Priority B	Rehabilitate	TR00901	8,00	10,83	2021	Reseal	0,00	10,84	5,67
2023	Priority B	Rehabilitate	TR01601	0,53	6,00	(blank)	None	0,00	0,00	5,47
2023	Priority B	Rehabilitate	TR02802	26,00	28,00	2025	Upgrade	25,20	43,26	2,00
2023	Priority B	Rehabilitate	TR08101	8,69	14,02	(blank)	None	0,00	0,00	5,33
2024	Priority C	Reseal	DR01440	0,00	2,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Reseal	DR01440	4,00	9,48	(blank)	None	0,00	0,00	5,48

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2024	Priority C	Reseal	DR01459	0,00	2,85	(blank)	None	0,00	0,00	2,85
2024	Priority C	Reseal	DR02157	0,00	1,03	(blank)	None	0,00	0,00	1,03
2024	Priority C	Reseal	MR00028	28,00	37,71	(blank)	None	0,00	0,00	9,71
2024	Priority C	Reseal	MR00218	0,00	5,56	(blank)	None	0,00	0,00	5,56
2024	Priority C	Reseal	MR00531	62,00	66,00	(blank)	None	0,00	0,00	4,00
2024	Priority C	Reseal	OP05873	0,00	2,03	(blank)	None	0,00	0,00	2,03
2024	Priority C	Reseal	TR02701	12,00	14,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Reseal	TR02701	36,00	38,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	DR01388	0,00	3,12	(blank)	None	0,00	0,00	3,12
2024	Priority C	Light Rehabilitation	DR01636	0,00	0,27	(blank)	None	0,00	0,00	0,27
2024	Priority C	Light Rehabilitation	DR01668	15,22	16,68	2020	Reseal	15,22	16,68	1,46
2024	Priority C	Light Rehabilitation	DR01888	2,60	2,64	(blank)	None	0,00	0,00	0,04
2024	Priority C	Light Rehabilitation	MR00027	51,94	54,00	(blank)	None	0,00	0,00	2,06
2024	Priority C	Light Rehabilitation	MR00027	54,00	56,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	MR00027	56,00	58,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	MR00027	58,00	62,00	(blank)	None	0,00	0,00	4,00
2024	Priority C	Light Rehabilitation	MR00027	62,00	64,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	MR00027	64,00	66,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	MR00166	0,11	4,71	(blank)	None	0,00	0,00	4,60
2024	Priority C	Light Rehabilitation	MR00172	0,05	1,25	2025	Reseal	0,05	1,25	1,20
2024	Priority C	Light Rehabilitation	MR00172	2,49	8,00	2025	Reseal	2,49	9,90	5,51
2024	Priority C	Light Rehabilitation	MR00177	8,17	18,00	(blank)	None	0,00	0,00	9,83
2024	Priority C	Light Rehabilitation	MR00177	20,00	22,00	2022	Reseal	19,60	30,15	2,00
2024	Priority C	Light Rehabilitation	MR00240	6,00	6,10	2020	Rehabilitate	5,36	14,28	0,10
2024	Priority C	Light Rehabilitation	MR00310	10,00	12,00	2024	Reseal	1,91	22,00	2,00
2024	Priority C	Light Rehabilitation	MR00310	34,00	36,00	(blank)	None	0,00	0,00	2,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2024	Priority C	Light Rehabilitation	MR00355	54,54	54,68	2023	Reseal	54,54	54,68	0,14
2024	Priority C	Light Rehabilitation	MR00402	0,00	1,21	2021	Reseal	0,00	1,21	1,21
2024	Priority C	Light Rehabilitation	TR01601	8,00	10,00	2027	Reseal	4,68	14,00	2,00
2024	Priority C	Light Rehabilitation	TR02103	0,82	6,00	(blank)	None	0,00	0,00	5,18
2024	Priority C	Light Rehabilitation	TR02103	6,00	8,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	TR02103	8,00	10,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Light Rehabilitation	TR02501	37,00	42,21	2024	Reseal	37,00	42,21	5,21
2024	Priority C	Light Rehabilitation	TR02801	4,00	10,00	(blank)	None	0,00	0,00	6,00
2024	Priority C	Light Rehabilitation	TR02801	12,00	16,00	(blank)	None	0,00	0,00	4,00
2024	Priority C	Light Rehabilitation	TR02801	26,69	29,46	2026	Reseal	26,69	29,46	5,54
2024	Priority C	Rehabilitate	MR00027	20,00	22,00	(blank)	None	0,00	0,00	2,00
2024	Priority C	Rehabilitate	MR00027	26,00	31,20	(blank)	None	0,00	0,00	5,20
2024	Priority C	Rehabilitate	MR00174	50,00	58,49	(blank)	None	0,00	0,00	8,49
2024	Priority C	Rehabilitate	MR00174	50,00	58,49	2028	Upgrade	47,15	60,06	8,49
2024	Priority C	Rehabilitate	TR08101	8,69	14,02	(blank)	None	0,00	0,00	5,33
2025	Priority C	Light Rehabilitation	DR01110	0,78	4,80	(blank)	None	0,00	0,00	4,02
2025	Priority C	Light Rehabilitation	DR01130	0,00	0,03	(blank)	None	0,00	0,00	0,03
2025	Priority C	Light Rehabilitation	DR01210	26,66	27,01	(blank)	None	0,00	0,00	0,35
2025	Priority C	Light Rehabilitation	MR00220	0,00	8,24	2019	Reseal	0,00	8,24	8,24
2025	Priority C	Light Rehabilitation	MR00289	0,00	12,00	(blank)	None	0,00	0,00	12,00
2025	Priority C	Light Rehabilitation	MR00347	6,00	8,00	2022	Reseal	4,80	9,34	2,00
2025	Priority C	Light Rehabilitation	MR00548	2,00	12,00	2027	Reseal	0,00	15,61	10,00
2025	Priority C	Light Rehabilitation	MR00548	12,00	14,00	2027	Reseal	0,00	15,61	2,00
2025	Priority C	Light Rehabilitation	OP07644	0,00	3,75	(blank)	None	0,00	0,00	3,75
2025	Priority C	Light Rehabilitation	TR00209	12,00	14,00	(blank)	None	0,00	0,00	2,00
2025	Priority C	Light Rehabilitation	TR00209	14,00	16,00	(blank)	None	0,00	0,00	2,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2025	Priority C	Light Rehabilitation	TR02102	24,60	34,00	2027	Reseal	24,60	36,65	9,40
2025	Priority C	Light Rehabilitation	TR02202	32,00	34,00	2023	Reseal	0,85	54,00	2,00
2025	Priority C	Light Rehabilitation	TR02303	34,00	35,12	(blank)	None	0,00	0,00	1,12
2025	Priority C	Light Rehabilitation	TR02701	0,00	4,00	(blank)	None	0,00	0,00	4,00
2025	Priority C	Light Rehabilitation	TR02701	4,00	12,00	(blank)	None	0,00	0,00	8,00
2025	Priority C	Light Rehabilitation	TR02701	14,00	18,00	(blank)	None	0,00	0,00	4,00
2025	Priority C	Light Rehabilitation	TR03201	42,00	44,00	2023	Reseal	31,20	44,00	2,00
2025	Priority C	Light Rehabilitation	TR07701	48,22	50,00	2022	Reseal	48,22	71,41	1,78
2025	Priority C	Rehabilitate	MR00133	8,76	10,03	(blank)	None	0,00	0,00	1,27
2025	Priority C	Rehabilitate	MR00188	11,13	16,00	(blank)	None	0,00	0,00	4,87
2025	Priority C	Rehabilitate	TR02801	16,00	28,00	(blank)	None	0,00	0,00	12,00
2026	Priority C	Light Rehabilitation	DR01126	12,00	18,82	(blank)	None	0,00	0,00	6,82
2026	Priority C	Light Rehabilitation	DR01134	0,00	1,58	(blank)	None	0,00	0,00	1,58
2026	Priority C	Light Rehabilitation	DR01146	5,91	6,41	(blank)	None	0,00	0,00	0,50
2026	Priority C	Light Rehabilitation	DR01394	6,00	10,00	(blank)	None	0,00	0,00	4,00
2026	Priority C	Light Rehabilitation	DR01438	0,50	2,00	2025	Reseal	0,50	3,22	1,50
2026	Priority C	Light Rehabilitation	DR01489	0,00	1,03	2025	Reseal	0,00	1,03	1,03
2026	Priority C	Light Rehabilitation	DR01590	0,00	2,88	(blank)	None	0,00	0,00	2,88
2026	Priority C	Light Rehabilitation	DR01600	0,00	6,89	2023	Reseal	0,00	6,89	6,89
2026	Priority C	Light Rehabilitation	MR00174	17,64	20,00	2024	Reseal	17,25	31,70	2,36
2026	Priority C	Light Rehabilitation	MR00224	20,00	26,00	(blank)	None	0,00	0,00	6,00
2026	Priority C	Light Rehabilitation	MR00224	26,00	28,00	(blank)	None	0,00	0,00	2,00
2026	Priority C	Light Rehabilitation	MR00228	21,22	22,64	(blank)	None	0,00	0,00	1,42
2026	Priority C	Light Rehabilitation	MR00261	2,00	29,03	(blank)	None	0,00	0,00	27,03
2026	Priority C	Light Rehabilitation	MR00270	0,00	0,08	(blank)	None	0,00	0,00	0,08
2026	Priority C	Light Rehabilitation	MR00277	28,00	30,90	2021	Reseal	24,90	30,90	2,90

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2026	Priority C	Light Rehabilitation	MR00348	10,00	12,00	(blank)	None	0,00	0,00	2,00
2026	Priority C	Light Rehabilitation	MR00351	0,00	2,00	2023	Reseal	0,00	17,67	2,00
2026	Priority C	Light Rehabilitation	MR00533	5,61	8,00	2019	Reseal	5,61	13,19	2,39
2026	Priority C	Light Rehabilitation	MR00533	8,00	13,13	2019	Reseal	5,61	13,19	5,13
2026	Priority C	Light Rehabilitation	MR00548	0,00	2,00	2027	Reseal	0,00	15,61	2,00
2026	Priority C	Light Rehabilitation	TR00209	4,00	6,00	(blank)	None	0,00	0,00	2,00
2026	Priority C	Light Rehabilitation	TR00209	6,00	12,00	(blank)	None	0,00	0,00	6,00
2026	Priority C	Light Rehabilitation	TR00902	34,28	50,00	(blank)	None	0,00	0,00	15,72
2026	Priority C	Light Rehabilitation	TR02202	40,00	48,00	2023	Reseal	0,85	54,00	8,00
2026	Priority C	Light Rehabilitation	TR02303	18,00	20,00	(blank)	None	0,00	0,00	2,00
2026	Priority C	Light Rehabilitation	TR02701	18,00	26,00	(blank)	None	0,00	0,00	8,00
2026	Priority C	Light Rehabilitation	TR02701	26,00	30,00	(blank)	None	0,00	0,00	4,00
2026	Priority C	Light Rehabilitation	TR02701	30,00	36,00	(blank)	None	0,00	0,00	6,00
2026	Priority C	Light Rehabilitation	TR02901	36,00	40,00	(blank)	None	0,00	0,00	4,00
2026	Priority C	Light Rehabilitation	TR03002	38,00	40,00	2024	Reseal	34,65	47,39	2,00
2026	Priority C	Light Rehabilitation	TR03104	60,00	62,00	2022	Reseal	30,80	76,06	2,00
2026	Priority C	Light Rehabilitation	TR03105	0,42	26,00	(blank)	None	0,00	0,00	25,58
2026	Priority C	Light Rehabilitation	TR03105	28,00	30,00	(blank)	None	0,00	0,00	2,00
2026	Priority C	Light Rehabilitation	TR03105	42,00	47,63	(blank)	None	0,00	0,00	5,63
2026	Priority C	Light Rehabilitation	TR03106	1,10	4,00	(blank)	None	0,00	0,00	2,90
2026	Priority C	Light Rehabilitation	TR03106	4,00	14,00	(blank)	None	0,00	0,00	10,00
2026	Priority C	Light Rehabilitation	TR03201	38,00	42,00	2023	Reseal	31,20	44,00	4,00
2026	Priority C	Light Rehabilitation	TR07701	82,00	86,00	(blank)	None	0,00	0,00	4,00
2026	Priority C	Light Rehabilitation	TR07701	88,00	90,00	(blank)	None	0,00	0,00	2,00
2027	Priority C	Light Rehabilitation	DR01090	0,00	4,00	2024	Reseal	0,00	6,73	4,00
2027	Priority C	Light Rehabilitation	DR01373	2,06	3,27	(blank)	None	0,00	0,00	1,21

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2027	Priority C	Light Rehabilitation	DR01398	1,29	4,00	(blank)	None	0,00	0,00	2,71
2027	Priority C	Light Rehabilitation	DR01398	4,00	12,00	(blank)	None	0,00	0,00	8,00
2027	Priority C	Light Rehabilitation	DR01693	11,10	11,42	(blank)	None	0,00	0,00	0,32
2027	Priority C	Light Rehabilitation	MR00224	28,00	32,53	(blank)	None	0,00	0,00	4,53
2027	Priority C	Light Rehabilitation	MR00227	0,00	8,00	2022	Asphalt Overlay	0,00	8,08	8,00
2027	Priority C	Light Rehabilitation	MR00291	0,00	8,99	2024	Reseal	0,00	8,99	8,99
2027	Priority C	Light Rehabilitation	MR00390	0,00	4,00	(blank)	None	0,00	0,00	4,00
2027	Priority C	Light Rehabilitation	MR00394	0,00	2,00	(blank)	None	0,00	0,00	2,00
2027	Priority C	Light Rehabilitation	MR00547	1,66	14,00	(blank)	None	0,00	0,00	12,34
2027	Priority C	Light Rehabilitation	MR00547	46,00	56,00	(blank)	None	0,00	0,00	10,00
2027	Priority C	Light Rehabilitation	TR01601	6,00	8,00	2027	Reseal	4,68	14,00	2,00
2027	Priority C	Light Rehabilitation	TR02103	10,00	20,49	(blank)	None	0,00	0,00	10,49
2027	Priority C	Light Rehabilitation	TR02202	30,00	32,00	2023	Reseal	0,85	54,00	2,00
2027	Priority C	Light Rehabilitation	TR02202	34,00	40,00	2023	Reseal	0,85	54,00	6,00
2027	Priority C	Light Rehabilitation	TR02303	12,90	18,00	(blank)	None	0,00	0,00	5,10
2027	Priority C	Light Rehabilitation	TR02303	32,00	34,00	(blank)	None	0,00	0,00	2,00
2027	Priority C	Light Rehabilitation	TR02901	1,49	22,00	(blank)	None	0,00	0,00	20,51
2027	Priority C	Light Rehabilitation	TR02901	34,00	36,00	(blank)	None	0,00	0,00	2,00
2027	Priority C	Light Rehabilitation	TR02901	58,32	71,73	(blank)	None	0,00	0,00	13,41
2027	Priority C	Light Rehabilitation	TR03104	30,89	38,00	2022	Reseal	30,80	76,06	7,11
2027	Priority C	Light Rehabilitation	TR03104	62,00	76,06	2022	Reseal	30,80	76,06	14,06
2027	Priority C	Light Rehabilitation	TR07701	86,00	88,00	(blank)	None	0,00	0,00	2,00
2027	Priority C	Light Rehabilitation	TR07701	90,00	94,00	(blank)	None	0,00	0,00	4,00
2027	Priority C	Light Rehabilitation	TR07701	94,00	100,00	(blank)	None	0,00	0,00	6,00
2028	Priority C	Light Rehabilitation	DR01090	4,00	6,73	2024	Reseal	0,00	6,73	2,73
2028	Priority C	Light Rehabilitation	DR01129	0,00	2,82	(blank)	None	0,00	0,00	2,82

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2028	Priority C	Light Rehabilitation	DR01413	3,79	6,59	(blank)	None	0,00	0,00	2,80
2028	Priority C	Light Rehabilitation	DR02188	0,00	9,75	(blank)	None	0,00	0,00	9,75
2028	Priority C	Light Rehabilitation	MR00289	14,00	16,00	(blank)	None	0,00	0,00	2,00
2028	Priority C	Light Rehabilitation	MR00335	0,00	3,12	2019	Reseal	0,00	3,12	3,12
2028	Priority C	Light Rehabilitation	MR00348	8,00	10,00	(blank)	None	0,00	0,00	2,00
2028	Priority C	Light Rehabilitation	MR00351	2,00	4,00	2023	Reseal	0,00	17,67	2,00
2028	Priority C	Light Rehabilitation	MR00365	4,00	8,00	2024	Reseal	0,00	14,12	4,00
2028	Priority C	Light Rehabilitation	MR00526	0,00	2,00	(blank)	None	0,00	0,00	2,00
2028	Priority C	Light Rehabilitation	MR00531	0,00	0,66	(blank)	None	0,00	0,00	0,66
2028	Priority C	Light Rehabilitation	MR00531	2,68	8,00	(blank)	None	0,00	0,00	5,32
2028	Priority C	Light Rehabilitation	MR00531	10,00	14,00	(blank)	None	0,00	0,00	4,00
2028	Priority C	Light Rehabilitation	MR00531	14,00	20,00	(blank)	None	0,00	0,00	6,00
2028	Priority C	Light Rehabilitation	MR00531	20,00	22,00	(blank)	None	0,00	0,00	2,00
2028	Priority C	Light Rehabilitation	MR00543	0,00	0,58	2021	Reseal	0,00	0,58	0,58
2028	Priority C	Light Rehabilitation	MR00546	40,00	46,00	2024	Reseal	37,45	52,80	6,00
2028	Priority C	Light Rehabilitation	OP04087	0,00	3,92	(blank)	None	0,00	0,00	3,92
2028	Priority C	Light Rehabilitation	TR02101	0,00	9,00	(blank)	None	0,00	0,00	9,00
2028	Priority C	Light Rehabilitation	TR02101	16,00	28,00	(blank)	None	0,00	0,00	12,00
2028	Priority C	Light Rehabilitation	TR02202	18,00	20,00	2023	Reseal	0,85	54,00	2,00
2028	Priority C	Light Rehabilitation	TR02303	24,00	32,00	(blank)	None	0,00	0,00	8,00
2028	Priority C	Light Rehabilitation	TR02501	10,00	16,00	(blank)	None	0,00	0,00	6,00
2028	Priority C	Light Rehabilitation	TR02501	16,00	17,88	(blank)	None	0,00	0,00	1,88
2028	Priority C	Light Rehabilitation	TR02801	0,00	2,00	(blank)	None	0,00	0,00	2,00
2028	Priority C	Light Rehabilitation	TR02901	42,00	56,13	(blank)	None	0,00	0,00	14,13
2028	Priority C	Light Rehabilitation	TR03104	50,00	56,00	2022	Reseal	30,80	76,06	6,00
2028	Priority C	Light Rehabilitation	TR03105	30,00	36,00	(blank)	None	0,00	0,00	6,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2028	Priority C	Light Rehabilitation	TR03304	2,00	8,00	2023	Reseal	2,00	19,30	6,00
2028	Priority C	Light Rehabilitation	TR03402	14,00	16,00	(blank)	None	0,00	0,00	2,00
2028	Priority C	Light Rehabilitation	TR07701	100,00	126,00	(blank)	None	0,00	0,00	26,00
2028	Priority C	Light Rehabilitation	TR08301	1,85	6,00	(blank)	None	0,00	0,00	4,15
2029	Priority C	Light Rehabilitation	DR01125	0,00	2,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	DR01125	4,00	6,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	DR01126	0,00	2,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	DR01126	9,16	12,00	(blank)	None	0,00	0,00	2,84
2029	Priority C	Light Rehabilitation	DR01138	0,00	2,47	(blank)	None	0,00	0,00	2,47
2029	Priority C	Light Rehabilitation	DR01205	0,00	2,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	DR01205	2,00	4,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	DR01205	12,00	16,00	2019	Reseal	7,90	35,50	4,00
2029	Priority C	Light Rehabilitation	DR01205	16,00	18,00	2019	Reseal	7,90	35,50	2,00
2029	Priority C	Light Rehabilitation	DR01241	0,00	0,40	(blank)	None	0,00	0,00	0,40
2029	Priority C	Light Rehabilitation	DR01379	6,00	7,41	2024	Reseal	0,00	7,41	1,41
2029	Priority C	Light Rehabilitation	DR01437	0,00	0,10	(blank)	None	0,00	0,00	0,10
2029	Priority C	Light Rehabilitation	DR01439	0,00	0,20	(blank)	None	0,00	0,00	0,20
2029	Priority C	Light Rehabilitation	DR01578	30,00	31,13	2019	Reseal	23,34	31,13	1,13
2029	Priority C	Light Rehabilitation	DR01609	0,00	0,38	2021	Reseal	0,00	0,38	0,38
2029	Priority C	Light Rehabilitation	DR01609	0,00	0,38	2022	Upgrade	0,00	6,43	0,38
2029	Priority C	Light Rehabilitation	DR01620	2,11	3,55	(blank)	None	0,00	0,00	1,44
2029	Priority C	Light Rehabilitation	MR00201	14,00	16,00	2021	Reseal	13,85	38,64	2,00
2029	Priority C	Light Rehabilitation	MR00264	46,00	58,52	(blank)	None	0,00	0,00	12,52
2029	Priority C	Light Rehabilitation	MR00269	14,00	16,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	MR00269	22,00	24,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	MR00282	18,00	19,03	(blank)	None	0,00	0,00	1,03

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2029	Priority C	Light Rehabilitation	MR00283	3,80	5,04	(blank)	None	0,00	0,00	1,24
2029	Priority C	Light Rehabilitation	MR00289	16,00	18,54	(blank)	None	0,00	0,00	2,54
2029	Priority C	Light Rehabilitation	MR00290	2,00	4,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	MR00303	3,66	8,00	(blank)	None	0,00	0,00	4,34
2029	Priority C	Light Rehabilitation	MR00312	6,80	10,22	(blank)	None	0,00	0,00	3,42
2029	Priority C	Light Rehabilitation	MR00346	0,00	2,00	2022	Reseal	0,00	8,50	2,00
2029	Priority C	Light Rehabilitation	MR00347	16,00	19,19	(blank)	None	0,00	0,00	3,19
2029	Priority C	Light Rehabilitation	MR00348	14,96	17,03	2021	Reseal	14,96	17,03	2,07
2029	Priority C	Light Rehabilitation	MR00355	68,00	70,83	2023	Reseal	56,98	70,83	2,83
2029	Priority C	Light Rehabilitation	MR00365	10,00	12,00	2024	Reseal	0,00	14,12	2,00
2029	Priority C	Light Rehabilitation	MR00394	2,00	4,50	(blank)	None	0,00	0,00	2,50
2029	Priority C	Light Rehabilitation	MR00531	8,00	10,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	MR00531	22,00	30,00	(blank)	None	0,00	0,00	8,00
2029	Priority C	Light Rehabilitation	MR00546	32,00	34,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	MR00546	50,00	52,00	2024	Reseal	37,45	52,80	2,00
2029	Priority C	Light Rehabilitation	OP05601	0,00	2,57	2021	Reseal	0,00	2,57	2,57
2029	Priority C	Light Rehabilitation	OP05657	0,00	0,67	(blank)	None	0,00	0,00	0,67
2029	Priority C	Light Rehabilitation	OP07647	0,00	4,00	(blank)	None	0,00	0,00	4,00
2029	Priority C	Light Rehabilitation	OP08055	0,00	0,78	2021	Reseal	0,00	0,78	0,78
2029	Priority C	Light Rehabilitation	OP08055	0,00	0,78	(blank)	None	0,00	0,00	0,78
2029	Priority C	Light Rehabilitation	TR01602	22,00	24,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	TR01602	22,00	24,00	2028	Reseal	7,90	34,85	2,00
2029	Priority C	Light Rehabilitation	TR02202	20,00	24,00	2023	Reseal	0,85	54,00	4,00
2029	Priority C	Light Rehabilitation	TR02901	24,00	32,00	(blank)	None	0,00	0,00	8,00
2029	Priority C	Light Rehabilitation	TR02902	1,63	8,00	(blank)	None	0,00	0,00	6,37
2029	Priority C	Light Rehabilitation	TR03002	22,00	26,00	2024	Reseal	21,50	34,65	4,00

OPTIMUM DELIVERY YEAR	PRIORITY	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	SCHEDULED DELIVERY YEAR	SCHEDULED TREATMENT	SHEDULED START KM	SCHEDULED END KM	TOTAL DTIMS LENGTH
2029	Priority C	Light Rehabilitation	TR03103	58,00	61,49	2023	Reseal	47,00	61,49	3,49
2029	Priority C	Light Rehabilitation	TR03104	8,00	10,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	TR03104	14,00	16,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	TR03105	38,00	40,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	TR03105	40,00	42,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	TR03304	20,00	22,00	2023	Reseal	19,30	28,45	2,00
2029	Priority C	Light Rehabilitation	TR03304	22,00	26,00	2023	Reseal	19,30	28,45	4,00
2029	Priority C	Light Rehabilitation	TR04401	12,00	14,00	2021	Reseal	0,00	36,76	2,00
2029	Priority C	Light Rehabilitation	TR05501	2,00	4,00	(blank)	None	0,00	0,00	2,00
2029	Priority C	Light Rehabilitation	TR05901	68,32	68,75	(blank)	None	0,00	0,00	0,43
2029	Priority C	Light Rehabilitation	TR07701	134,00	140,71	(blank)	None	0,00	0,00	6,71

Unscheduled priorities

This is a list of dTIMS identified Candidate Projects that are not associated with any Rehabilitation, Reseal, Reconstruct or Upgrade deliverable scheduled on RPM. This list is useful for identifying next project priorities/consultant appointments.

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
2022	Light Rehabilitation	DR01098	8,79	14,24	5,45
		DR01118	1,05	6,31	5,26
		DR01300	1,37	4,36	2,99
		DR01788	0,00	1,46	1,46
		MR00199	20,00	22,46	2,46
		MR00210	0,06	0,87	0,81
		MR00224	2,35	6,00	3,65
		MR00306	0,36	0,72	0,36
		MR00310	20,00	22,00	2,00
		MR00365	8,00	10,00	2,00
		MR00547	14,00	21,55	7,55
		MR00547	23,10	26,00	2,90
		MR00547	26,00	30,00	4,00
		MR00547	30,00	34,00	4,00
		OP05742	0,00	2,00	2,00
		TR00102	66,00	70,00	4,00
		TR00202	2,00	6,00	12,00
		TR00210	54,76	59,15	4,39
		TR00902	6,00	10,00	4,00
		TR02303	20,00	24,00	4,00
		TR02501	8,00	10,00	2,00
		TR02801	10,00	12,00	2,00
		TR02901	32,00	34,00	2,00
		TR03002	12,00	14,00	2,00
		TR03002	14,00	16,00	4,00
		TR03106	18,00	20,00	2,00
		TR03305	24,00	26,00	2,00
	Light Rehabilitation Total				**91,28**
	Rehabilitate	MR00027	26,00	31,20	5,20
		MR00199	18,00	20,00	2,00
		MR00205	0,00	6,00	6,00
		MR00310	1,91	8,00	6,09
		TR00201	2,00	8,00	18,00
		TR03106	14,00	18,00	4,00
	Rehabilitate Total				**41,29**

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
	Reseal	DR01119	4,66	7,27	2,61
		DR01254	0,00	12,29	12,29
		DR01342	14,00	18,00	4,00
		DR01359	0,00	3,00	3,00
		DR01363	0,00	2,84	5,68
		DR01368	0,00	2,00	2,00
		DR01368	2,00	3,35	1,35
		DR01386	0,00	4,00	4,00
		DR01390	0,00	4,00	4,00
		DR01390	4,00	6,93	2,93
		DR01398	14,00	22,00	8,00
		DR01400	0,00	6,00	12,00
		DR01408	1,44	6,37	4,93
		DR01429	0,00	0,25	0,25
		DR01441	0,00	1,93	1,93
		DR01452	4,00	10,00	6,00
		DR01453	0,00	2,38	2,38
		DR01461	0,72	2,00	1,28
		DR01532	0,00	2,00	4,00
		DR01532	8,00	10,00	4,00
		DR01532	14,00	17,16	6,32
		DR01645	0,00	2,00	2,00
		DR01671	0,00	2,00	2,00
		DR01671	2,00	7,27	5,27
		DR01680	0,00	5,15	5,15
		DR01709	2,00	6,74	4,74
		DR01770	10,00	12,33	2,33
		DR01834	4,00	7,41	3,41
		DR02175	0,00	12,00	12,00
		DR02178	0,00	6,00	6,00
		DR02180	19,90	24,00	4,10
		DR02184	14,00	16,30	2,30
		DR02220	0,00	3,57	3,57
		DR02221	0,00	2,39	2,39
		MR00028	0,54	24,00	23,46
		MR00174	44,00	46,15	2,15
		MR00188	22,00	24,00	2,00
		MR00229	0,00	1,88	1,88
		MR00262	0,00	2,00	2,00
		MR00271	10,00	34,00	24,00

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		MR00286	22,72	26,00	3,28
		MR00310	72,00	76,00	4,00
		MR00310	76,00	78,00	2,00
		MR00331	1,43	10,54	18,22
		MR00334	2,00	6,00	4,00
		MR00334	6,00	8,00	2,00
		MR00334	8,00	14,00	6,00
		MR00337	2,00	4,00	2,00
		MR00532	0,00	5,53	5,53
		MR00546	46,00	50,00	4,00
		MR00547	66,00	70,00	4,00
		MR00552	10,00	12,00	2,00
		MR00557	0,00	1,36	1,36
		OP04019	0,00	2,00	2,00
		OP04068	0,00	4,09	4,09
		OP05223	0,00	1,44	1,44
		OP05255	0,00	1,41	1,41
		OP05362	0,00	1,83	1,83
		OP06456	0,00	0,65	0,65
		TR00101	4,00	14,00	10,00
		TR01609	30,00	32,00	4,00
		TR02201	24,00	26,00	4,00
		TR02901	40,00	42,00	2,00
		TR03101	8,00	12,00	8,00
	Reseal Total				**301,51**
2023	Light Rehabilitation	DR01343	0,44	3,10	2,66
		DR01373	0,00	0,74	0,74
		DR01412	0,00	1,71	1,71
		DR01416	1,80	4,00	2,20
		DR01418	0,00	3,68	3,68
		DR01592	0,00	0,32	0,32
		DR02183	27,01	27,32	0,31
		MR00172	8,00	15,76	7,76
		MR00174	0,00	0,60	0,60
		MR00174	30,28	32,00	1,72
		MR00201	46,10	50,23	4,13
		MR00231	0,00	0,03	0,03
		MR00261	0,80	2,00	2,40
		MR00290	0,25	2,00	1,75
		MR00305	0,00	1,30	1,30

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		MR00332	0,00	0,04	0,04
		MR00347	3,24	6,00	2,76
		MR00347	12,45	16,00	3,55
		MR00547	34,00	42,00	8,00
		MR00547	42,00	46,00	4,00
		OP04232	0,00	0,55	0,55
		TR00209	0,00	2,00	2,00
		TR01602	24,00	25,00	1,00
		TR02801	2,00	4,00	2,00
		TR02801	28,00	29,46	4,38
		TR03104	56,00	58,00	2,00
		TR03105	36,00	38,00	2,00
		TR03305	26,00	28,00	2,00
		TR07701	24,59	26,00	1,41
		TR07701	50,00	54,00	4,00
	Light Rehabilitation Total				**71,00**
	Rehabilitate	MR00303	0,00	0,34	0,34
		TR00901	0,00	8,00	16,00
		TR00901	8,00	10,81	5,62
		TR00901	8,00	10,83	5,67
		TR01601	0,53	6,00	5,47
		TR02802	26,00	28,00	2,00
		TR08101	8,69	14,02	5,33
	Rehabilitate Total				**40,43**
	Reseal	DR01119	3,74	4,59	0,85
		DR01161	0,00	4,00	4,00
		DR01161	4,00	8,00	4,00
		DR01162	21,50	22,43	0,93
		DR01170	0,00	3,58	3,58
		DR01342	18,00	20,15	2,15
		DR01372	0,00	6,00	6,00
		DR01420	0,00	0,56	0,56
		DR01440	2,00	4,00	2,00
		DR01452	2,00	4,00	2,00
		DR01487	120,00	123,32	6,64
		DR01549	0,00	1,03	1,03
		DR01573	7,93	9,06	1,13
		DR01645	2,00	4,00	2,00
		DR01645	4,00	5,40	1,40
		DR01709	0,00	2,00	2,00

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		DR02151	3,02	4,19	1,17
		DR02180	24,00	35,68	11,68
		DR02191	0,00	0,40	0,80
		DR02227	0,00	2,82	2,82
		DR02232	0,00	8,00	16,00
		DR02232	10,00	12,00	4,00
		DR02232	12,00	18,00	12,00
		DR02232	18,00	20,00	4,00
		DR02232	20,00	22,00	4,00
		DR02232	22,00	24,00	4,00
		MR00028	24,00	28,00	4,00
		MR00174	32,00	42,00	10,00
		MR00174	42,00	44,00	2,00
		MR00177	22,00	24,36	2,36
		MR00187	8,00	10,00	4,00
		MR00295	4,00	6,00	2,00
		MR00310	68,00	72,00	4,00
		MR00334	16,00	26,49	10,49
		MR00337	33,21	36,00	2,79
		MR00337	36,00	38,00	2,00
		MR00337	38,00	40,00	2,00
		MR00337	40,00	42,00	2,00
		MR00337	44,00	46,00	2,00
		MR00403	4,00	8,00	4,00
		MR00403	12,00	13,03	1,03
		MR00531	66,00	70,00	4,00
		MR00547	56,00	66,00	10,00
		MR00547	70,00	72,81	2,81
		MR00559	14,00	16,31	2,31
		MR00559	15,83	16,31	0,48
		MR00582	40,00	44,00	4,00
		MR00582	44,00	52,00	8,00
		MR00582	52,00	54,00	2,00
		MR00582	54,00	68,00	14,00
		MR00582	68,00	74,00	6,00
		OP05543	0,00	2,00	2,00
		OP06887	1,41	2,41	1,00
		OP08081	0,00	0,29	0,29
		OP08081	1,28	2,82	1,54
		TR08801	68,00	70,20	2,20

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
	Reseal Total				**216,04**
2024	Light Rehabilitation	DR01388	0,00	3,12	3,12
		DR01636	0,00	0,27	0,27
		DR01668	15,22	16,68	2,92
		DR01888	2,60	2,64	0,04
		MR00027	51,94	54,00	2,06
		MR00027	54,00	56,00	2,00
		MR00027	56,00	58,00	2,00
		MR00027	58,00	62,00	4,00
		MR00027	62,00	64,00	2,00
		MR00027	64,00	66,00	2,00
		MR00166	0,11	4,71	4,60
		MR00172	0,05	1,25	2,40
		MR00172	2,49	8,00	11,02
		MR00177	8,17	18,00	9,83
		MR00177	20,00	22,00	2,00
		MR00240	6,00	6,10	0,10
		MR00310	10,00	12,00	2,00
		MR00310	34,00	36,00	2,00
		MR00355	54,54	54,68	0,14
		MR00402	0,00	1,21	1,21
		TR01601	8,00	10,00	4,00
		TR02103	0,82	6,00	5,18
		TR02103	6,00	8,00	2,00
		TR02103	8,00	10,00	2,00
		TR02501	37,00	42,21	10,42
		TR02801	4,00	10,00	6,00
		TR02801	12,00	16,00	4,00
		TR02801	26,69	29,46	8,31
	Light Rehabilitation Total				**97,62**
	Rehabilitate	MR00027	20,00	22,00	2,00
		MR00027	26,00	31,20	5,20
		MR00174	50,00	58,49	16,98
		TR08101	8,69	14,02	5,33
	Rehabilitate Total				**29,51**
	Reseal	DR01440	0,00	2,00	2,00
		DR01440	4,00	9,48	5,48
		DR01459	0,00	2,85	2,85
		DR02157	0,00	1,03	1,03
		MR00028	28,00	37,71	9,71

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		MR00218	0,00	5,56	5,56
		MR00531	62,00	66,00	4,00
		OP05873	0,00	2,03	2,03
		TR02701	12,00	14,00	2,00
		TR02701	36,00	38,00	2,00
	Reseal Total				**36,66**
2025	Light Rehabilitation	DR01110	0,78	4,80	4,02
		DR01130	0,00	0,03	0,03
		DR01210	26,66	27,01	0,35
		MR00220	0,00	8,24	8,24
		MR00289	0,00	12,00	12,00
		MR00347	6,00	8,00	4,00
		MR00548	2,00	12,00	20,00
		MR00548	12,00	14,00	4,00
		OP07644	0,00	3,75	3,75
		TR00209	12,00	14,00	2,00
		TR00209	14,00	16,00	2,00
		TR02102	24,60	34,00	18,80
		TR02202	32,00	34,00	2,00
		TR02303	34,00	35,12	1,12
		TR02701	0,00	4,00	4,00
		TR02701	4,00	12,00	8,00
		TR02701	14,00	18,00	4,00
		TR03201	42,00	44,00	2,00
		TR07701	48,22	50,00	1,78
	Light Rehabilitation Total				**102,09**
	Rehabilitate	MR00133	8,76	10,03	1,27
		MR00188	11,13	16,00	4,87
		TR02801	16,00	28,00	12,00
	Rehabilitate Total				**18.14**
2026	Light Rehabilitation	DR01126	12,00	18,82	6,82
		DR01134	0,00	1,58	1,58
		DR01146	5,91	6,41	0,50
		DR01394	6,00	10,00	4,00
		DR01438	0,50	2,00	3,00
		DR01489	0,00	1,03	1,03
		DR01590	0,00	2,88	2,88
		DR01600	0,00	6,89	13,78
		MR00174	17,64	20,00	2,36
		MR00224	20,00	26,00	6,00

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
			26,00	28,00	2,00
		MR00228	21,22	22,64	1,42
		MR00261	2,00	29,03	27,03
		MR00270	0,00	0,08	0,08
		MR00277	28,00	30,90	5,80
		MR00348	10,00	12,00	2,00
		MR00351	0,00	2,00	2,00
		MR00533	5,61	8,00	2,39
		MR00533	8,00	13,13	5,13
		MR00548	0,00	2,00	4,00
		TR00209	4,00	6,00	2,00
		TR00209	6,00	12,00	6,00
		TR00902	34,28	50,00	15,72
		TR02202	40,00	48,00	8,00
		TR02303	18,00	20,00	2,00
		TR02701	18,00	26,00	8,00
		TR02701	26,00	30,00	4,00
		TR02701	30,00	36,00	6,00
		TR02901	36,00	40,00	4,00
		TR03002	38,00	40,00	4,00
		TR03104	60,00	62,00	2,00
		TR03105	0,42	26,00	25,58
		TR03105	28,00	30,00	2,00
		TR03105	42,00	47,63	5,63
		TR03106	1,10	4,00	2,90
		TR03106	4,00	14,00	10,00
		TR03201	38,00	42,00	4,00
		TR07701	82,00	86,00	4,00
		TR07701	88,00	90,00	2,00
	Light Rehabilitation Total				**211,63**
2027	Light Rehabilitation	DR01090	0,00	4,00	4,00
		DR01373	2,06	3,27	1,21
		DR01398	1,29	4,00	2,71
		DR01398	4,00	12,00	8,00
		DR01693	11,10	11,42	0,32
		MR00224	28,00	32,53	4,53
		MR00227	0,00	8,00	16,00
		MR00291	0,00	8,99	17,98
		MR00390	0,00	4,00	4,00
		MR00394	0,00	2,00	2,00

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		MR00547	1,66	14,00	12,34
		MR00547	46,00	56,00	10,00
		TR01601	6,00	8,00	4,00
		TR02103	10,00	20,49	10,49
		TR02202	30,00	32,00	2,00
		TR02202	34,00	40,00	6,00
		TR02303	12,90	18,00	5,10
		TR02303	32,00	34,00	2,00
		TR02901	1,49	22,00	20,51
		TR02901	34,00	36,00	2,00
		TR02901	58,32	71,73	13,41
		TR03104	30,89	38,00	7,11
		TR03104	62,00	76,06	14,06
		TR07701	86,00	88,00	2,00
		TR07701	90,00	94,00	4,00
		TR07701	94,00	100,00	6,00
	Light Rehabilitation Total				**181,77**
2028	Light Rehabilitation	DR01090	4,00	6,73	2,73
		DR01129	0,00	2,82	2,82
		DR01413	3,79	6,59	2,80
		DR02188	0,00	9,75	9,75
		MR00289	14,00	16,00	2,00
		MR00335	0,00	3,12	3,12
		MR00348	8,00	10,00	2,00
		MR00351	2,00	4,00	2,00
		MR00365	4,00	8,00	4,00
		MR00526	0,00	2,00	2,00
		MR00531	0,00	0,66	0,66
		MR00531	2,68	8,00	5,32
		MR00531	10,00	14,00	4,00
		MR00531	14,00	20,00	6,00
		MR00531	20,00	22,00	2,00
		MR00543	0,00	0,58	1,16
		MR00546	40,00	46,00	6,00
		OP04087	0,00	3,92	3,92
		TR02101	0,00	9,00	9,00
		TR02101	16,00	28,00	12,00
		TR02202	18,00	20,00	2,00
		TR02303	24,00	32,00	8,00
		TR02501	10,00	16,00	6,00

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		TR02501	16,00	17,88	1,88
		TR02801	0,00	2,00	2,00
		TR02901	42,00	56,13	14,13
		TR03104	50,00	56,00	6,00
		TR03105	30,00	36,00	6,00
		TR03304	2,00	8,00	6,00
		TR03402	14,00	16,00	2,00
		TR07701	100,00	126,00	26,00
		TR08301	1,85	6,00	4,15
	Light Rehabilitation Total				**167,44**
	Reconstruct	TR02202	2.00	4.00	2.00
	Reconstruct Total				**2,00**
2029	Light Rehabilitation	DR01125	0,00	2,00	2,00
		DR01125	4,00	6,00	2,00
		DR01126	0,00	2,00	2,00
		DR01126	9,16	12,00	2,84
		DR01138	0,00	2,47	2,47
		DR01205	0,00	2,00	2,00
		DR01205	2,00	4,00	2,00
		DR01205	12,00	16,00	4,00
		DR01205	16,00	18,00	2,00
		DR01241	0,00	0,40	0,40
		DR01379	6,00	7,41	2,82
		DR01437	0,00	0,10	0,10
		DR01439	0,00	0,20	0,20
		DR01578	30,00	31,13	1,13
		DR01609	0,00	0,38	0,76
		DR01620	2,11	3,55	1,44
		MR00201	14,00	16,00	2,00
		MR00264	46,00	58,52	12,52
		MR00269	14,00	16,00	2,00
		MR00269	22,00	24,00	2,00
		MR00282	18,00	19,03	1,03
		MR00283	3,80	5,04	1,24
		MR00289	16,00	18,54	2,54
		MR00290	2,00	4,00	2,00
		MR00303	3,66	8,00	4,34
		MR00312	6,80	10,22	3,42
		MR00346	0,00	2,00	4,00
		MR00347	16,00	19,19	3,19

OPTIMUM DELIVERY YEAR	RECOMMENDED TREATMENT	ROAD NUMBER	START KM	END KM	LENGTH
		MR00348	14,96	17,03	4,14
		MR00355	68,00	70,83	2,83
		MR00365	10,00	12,00	2,00
		MR00394	2,00	4,50	2,50
		MR00531	8,00	10,00	2,00
		MR00531	22,00	30,00	8,00
		MR00546	32,00	34,00	2,00
		MR00546	50,00	52,00	2,00
		OP05601	0,00	2,57	5,14
		OP05657	0,00	0,67	0,67
		OP07647	0,00	4,00	4,00
		OP08055	0,00	0,78	1,56
		TR01602	22,00	24,00	4,00
		TR02202	20,00	24,00	4,00
		TR02901	24,00	32,00	8,00
		TR02902	1,63	8,00	6,37
		TR03002	22,00	26,00	8,00
		TR03103	58,00	61,49	6,98
		TR03104	8,00	10,00	2,00
		TR03104	14,00	16,00	2,00
		TR03105	38,00	40,00	2,00
		TR03105	40,00	42,00	2,00
		TR03304	20,00	22,00	2,00
		TR03304	22,00	26,00	4,00
		TR04401	12,00	14,00	2,00
		TR05501	2,00	4,00	2,00
		TR05901	68,32	68,75	0,43
		TR07701	134,00	140,71	6,71
	Light Rehabilitation Total				**167,77**

Appendix L – Gazetted list of projects

Key to table headings

Delivery Mechanism (Individual project or Packaged program)

Total Expenditure (until 31 March 2022)

Note 1: Site handover/commencement of construction - date of letter of acceptance

Note 2: Construction completion date (take over date) - practical completion date

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration Date: Start Note 1	Project duration Date: Finish Note 2	Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
										R'000	R'000	R'000	R'000	R'000
1. Maintenance and Repairs														
Own Funds and Provincial Roads Maintenance Funds														
1	Data Collection for Asset Management (CUR)	Packaged Programme	Western Cape	Western Cape	2018/04/01	2025/04/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Packaged program	115 057	74 924	3 309	3 837	3 248
2	Maintenance - Paarl DRE	Packaged Programme	Region 1	Region 1	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	984 861	636 445	112 565	114 659	121 192
3	Maintenance - Oudtshoorn DRE	Packaged Programme	Region 2	Region 2	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	722 922	500 175	71 701	73 449	77 597
4	Maintenance - Cape Town PRMG	Packaged Programme	City of Cape Town	City of Cape Town	2015/04/01	2025/04/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Packaged program	1 105 338	932 768	23 000	22 000	17 000
5	Routine Maintenance ED DM	Packaged Programme	Garden Route	Garden Route	2017/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	690 650	408 504	89 480	93 060	99 605
6	Routine Maintenance WC DM	Packaged Programme	West Coast	West Coast	2017/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	531 388	284 873	77 985	81 105	87 425
7	Routine Maintenance CW DM	Packaged Programme	Cape Winelands	Cape Winelands	2017/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	462 022	269 992	62 000	63 430	66 600

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
8	Routine Maintenance OB	Packaged Programme	Overberg	Overberg	2017/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	317 148	177 033	44 440	46 215	49 460
9	Routine Maintenance CK DM	Packaged Programme	Central Karoo	Central Karoo	2017/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	198 859	120 878	24 730	25 720	27 530
10	Maintenance - Cape Town	Packaged Programme	City of Cape Town	City of Cape Town	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	264 4891	1 077 236	336 139	347 381	374 061
Sub-total										5 682 937	4 482 828	845 349	870 856	923 718
TOTAL: MAINTENANCE AND REPAIRS										**5 682 937**	**4 482 828**	**845 349**	**870 856**	**923 718**
2. NEW OR REPLACED INFRASTRUCUTRE														
Own Funds														
1	C1159 Extended R300 Freeway	Stage 2: Concept/Feasibility	City of Cape Town	City of Cape Town	2022/11/01	2028/04/01	Equitable Share	Transport Infrastructure	Individual Project	1 030 000	-	31 000	200 000	160 000
2	FMS on N1	Packaged Programme	City of Cape Town	City of Cape Town	2013/04/01	2025/04/01	Equitable Share	Transport Infrastructure	Packaged Programme	80 466	40 466	10 000	10 000	10 000
3	C377.1 George West bypass	Stage 2: Concept/Feasibility	Garden Route	George	2024/08/01	2028/04/01	Equitable Share	Transport Infrastructure	Individual Project	1 100 000	-	-	-	80 000
4	Design Fees New	Packaged Programme	Western Cape	Western Cape	2016/04/01	2025/04/01	Equitable Share	Transport Infrastructure	Individual Project	70 000	27 641	6 000	17 000	18 000
5	C967 Malmesbury Bypass	Stage 2: Concept/Feasibility	West Coast	Swartland	2023/01/01	2026/03/30	Equitable Share	Transport Infrastructure	Individual Project	350 000	-	20 000	100 000	130 000
Sub-total: Own Funds										2 630 466	68 107	67 000	327 000	398 000
TOTAL: NEW OR REPLACED INFRASTRUCUTRE										**2 630 466**	**68 107**	**67 000**	**327 000**	**398 000**
3. REHABILITATION, RENOVATIONS AND REFURBISHMENTS														
Own Funds and Provincial Roads Maintenance Funds														
1	C1105 Reseal Du Toits Kloof	Stage 5: Works	Cape Winelands	Drakenstein	2022/04/01	2024/03/31	Equitable share	Transport Infrastructure	Individual Project	96 200	-	87 000	2 000	-
2	OB DM Reseal	Packaged Programme	Overberg	Overberg	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	129 000	70 386	18 105	19 830	20 150

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure													
No.	Project name	Project status	District Municipality	Local Municipality	Project duration Date: Start Note 1	Project duration Date: Finish Note 2	Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
										R'000	R'000	R'000	R'000	R'000
3	CW DM Reseal	Packaged Programme	Cape Winelands	Cape Winelands	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	73 000	58 609	14 200	-	-
4	WC DM Reseal	Packaged Programme	West Coast	West Coast	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	174 000	116 272	17 890	19 605	19 930
5	ED DM Reseal	Packaged Programme	Garden Route	Garden Route	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	214 000	139 842	23 480	24 415	26 135
6	OB DM Regravel	Packaged Programme	Overberg	Overberg	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	262 000	165 554	31 430	31 370	32 940
7	CW DM Regravel	Packaged Programme	Cape Winelands	Cape Winelands	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	226 000	141 229	27 000	28 000	29 400
8	WC DM Regravel	Packaged Programme	West Coast	West Coast	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	240 000	161 446	23 400	25 335	26 045
9	ED DM Regravel	Packaged Programme	Garden Route	Garden Route	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	230 000	141 480	24 570	26 555	27 350
10	CK DM Regravel	Packaged Programme	Central Karoo	Central Karoo	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	248 700	144 309	30 750	32 980	34 230
11	Design Fees Rehabilitation	Packaged Programme	Western Cape	Western Cape	2016/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	495 000	366 730	71 468	72 928	73 000
12	C818 Ashton - Montagu	Stage 6: Handover	Cape Winelands	Langeberg	2019/05/02	2021/02/25	Equitable share	Transport Infrastructure	Individual Project	523 140	992 682	5 000	-	-
13	C1147 Reseal Strandfontein/Lutzville/Vredendal	Stage 3: Design Development	West Coast	Matzikama	2022/09/01	2023/06/01	Equitable share	Transport Infrastructure	Individual Project	68 000	-	55 000	13 000	-
14	C1149 Reseal Somerset West Sir Lowry`s pass	Stage 5: Works	City of Cape Town	City of Cape Town	2021/10/20	2022/06/21	Equitable share	Transport Infrastructure	Individual Project	63 275	-	-	1 000	-
15	C1150 PRMG Helshoogte rd - Franshoek	Stage 2: Concept/Feasibility	Cape Winelands	Stellenbosch	2023/06/01	2024/10/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	145 000	-	-	82 000	60 000
16	C1151 PRMG Kuilsriver-Stellenbosch	Stage 5: Works	Cape Winelands	Stellenbosch	2022-03-02	2022-10-14	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	65 000	-	64 000	-	-
17	C1152 PRMG Westcoast Rd - Atlantis-Yesterfontein	Stage 5: Works	West Coast	Swartland	2022/01/11	2022/12/10	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	53 700	-	50 000	-	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
18	C1153 Barrydale ladismith	Stage 5: Works	Garden Route	Kannaland	2021/10/08	2022/12/12	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	77 944	7 222	60 000	5 000	-
19	C1154 PRMG Hartenbos - Oudtshoorn	Stage 2: Concept/Feasibility	Garden Route	Mossel Bay	2023/06/01	2024/11/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	126 000	-	-	80 000	46 000
20	C1183 PRMG Klaarstroom Beaufort West	Stage 5: Works	Central Karoo	Beaufort West	2021-09-07	2023-03-06	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	254 500	-	130 000	75 000	4 000
21	C1184 Reseal N2	Stage 5: Works	City of Cape Town	City of Cape Town	2021-09-29	2022-10-11	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	147 000	15 966	108 000	3 000	-
22	C1203 PRMGReseal Trunk & Divisional roads around Worcester (58km)	Stage 1: Initiation/ Pre-feasibility	Cape Winelands	Breede Valley	2025/01/02	2026/02/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	115 000	-	-	-	20 000
23	C1205 PRMG Reseal Bonnievale/Ashton	Stage 2: Concept/Feasibility	Cape Winelands	Langeberg	2024/06/01	2025/02/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	43 000	-	-	-	40 000
24	C1125 Reseal Riversdal ladithsmith	Stage 4: Design Documentation	Garden Route	Kannaland	2022/11/01	2024/06/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	155 000	-	25 000	-	-
25	C1141 Reseal Montagu-Barrydale	Stage 2: Concept/Feasibility	Cape Winelands	Langeberg	2023/06/01	2024/06/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	105 000	-	-	60 000	45 000
26	C1149 PRMG Reseal N2 Somersetwest/Sir Lowry Bypass	Stage 5: Works	City of Cape Town	City of Cape Town	2021/10/20	2022/06/21	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	63 275	3 018	40 000	-	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
27	C1152 Westcoast Rd - Atlantis-Yesterfontein	Stage 5: Works	West Coast	Swartland	2022/01/11	2022/12/10	Equitable share	Transport Infrastructure	Individual Project	53 700	-	-	1 000	-
28	C1000.1 Hermanus - Gansbaai	Stage 5: Works	Overberg	Overstrand	2019/01/25	2022/04/12	Equitable share	Transport Infrastructure	Individual Project	488 759	-	25 228	-	-
29	C1008 Rehab Calitzdrop	Stage 5: Works	Garden Route	Oudtshoorn	2021/11/08	2024/05/07	Equitable share	Transport Infrastructure	Individual Project	178 939	4 960	85 000	62 000	2 000
30	C1151 Kuilsriver-Stellenbosch	Stage 5: Works	Cape Winelands	Stellenbosch	2022/03/02	2022/10/14	Equitable share	Transport Infrastructure	Individual Project	65 000	-	-	1 000	-
31	C1145 PRMG Voor Paardeberg rd	Stage 2: Concept/Feasibility	Cape Winelands	Drakenstein	2023/06/01	2024/05/01	Provincial Roads Maintenance Grant	Provincial Roads Maintenance Grant	Individual Project	72 000	-	-	60 000	12 000
32	C1201 Rehab/reseal MR264 Swellendam - Bredasdorp	Stage 2: Concept/Feasibility	Overberg	Cape Agulhas	2024/01/04	2025/08/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	108 000	-	-	-	100 000
33	C1155.3 Emergency flood damage repairs near Bonnievale (Bree River)	Stage 5: Works	Cape Winelands	Langeberg	2022/10/13	2022/06/13	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	19 738	-	9 000	1 000	-
34	C1158.1 Emergency flood damage repairs near Stormsvlei (Sonderend River)	Stage 5: Works	Overberg	Swellendam	2021/10/20	2022/09/20	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	36 348	-	16 000	1 000	-
35	C1183.1 Beaufort West area. Repair and replacement of bridge and large structures	Stage 5: Works	Central Karoo	Beaufort West	2022/03/15	2023/01/15	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	29 120	-	24 000	3 000	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
36	C1088.1 Reseal Stanford-Riviersonderend	Stage 5: Works	Overberg	Theewaterskloof	2021/10/19	2023/05/19	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	136 943	-	105 000	12 000	-
37	C1100 HOLGATEN-KAREEDOUW	Stage 6: Handover	Garden Route	George	2019/03/04	2021/11/22	Equitable share	Transport Infrastructure	Individual Project	182 255	-	5 000	-	-
38	C1092 SOMERSET WEST-STELLENBOSCH	Stage 6: Handover	Cape Winelands	Stellenbosch	2020/08/31	2021/03/03	Equitable share	Transport Infrastructure	Individual Project	80 852	-	1 000	-	-
39	C975.4 Carinus Bridge at Velddrift	Stage 1: Initiation/ Pre-feasibility	West Coast	Bergrivier	2023/04/01	2025/03/31	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	150 000	-	-	70 000	80 000
40	C802.5 St Helena - Stomp-neusbaai Phase2	Stage 3: Design Development	West Coast	Saldanha Bay	2023/01/01	2024/07/01	Equitable share	Transport Infrastructure	Individual Project	145 000	-	10 000	100 000	35 000
41	C1049.3 Rehab/upgrade Waarburgh/Protea Rd	Stage 3: Design Development	City of Cape Town	City of Cape Town	2023/01/01	2024/03/30	Equitable share	Transport Infrastructure	Individual Project	100 000	-	20 000	80 000	-
42	C1213 Reseal/rehab NC Border - N1 - Murraysburg	Stage 1: Initiation/ Pre-feasibility	Central Karoo	Beaufort West	2023/11/01	2026/03/31	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	137 000	-	-	27 000	100 000
43	C1214 Reseal MR331 Stilbaai-Jongensfontein	Stage 1: Initiation/ Pre-feasibility	Garden Route	Hessequa	2024/06/01	2025/02/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	27 000	-	-	-	26 000
44	C1215 Reseal Plettenberg Bay Airport road and others	Stage 1: Initiation/ Pre-feasibility	Garden Route	Bitou	2024/06/01	2025/02/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	37 000	-	-	-	36 000

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
45	C1216 Reseal/rehab Ceres-Opdie Berg-Citrusdal	Stage 1: Initiation/ Pre-feasibility	Cape Winelands	Witzenberg	2023/10/01	2025/06/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	183 000	-	-	39 000	115 000
46	C1217 Reseal Stellenbosch - Pniel (Helshoogte Pass)	Stage 1: Initiation/ Pre-feasibility	Cape Winelands	Stellenbosch	2024/04/01	2026/03/31	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	68 000	-	-	-	22 000
47	C914 Spier road phase 3	Stage 5: Works	Cape Winelands	Stellenbosch	2022-01-24	2024-01-23	Equitable share	Transport Infrastructure	Individual Project	249 507	-	120 000	120 000	5 000
48	C1093.1 N2-Villiersdorp	Stage 6: Handover	Overberg	Theewaterskloof	2020/11/20	2021/05/27	Equitable share	Transport Infrastructure	Individual Project	33 830	64 623	1 000	-	-
49	C1009 Kalbaskraal Road rehabilitation	Stage 6: Handover	City of Cape Town	City of Cape Town	2019/01/09	2021/07/23	Equitable share	Transport Infrastructure	Individual Project	81 902	46 864	2 000	-	-
50	C1097 Dwarskersbos Elandsbaai	Stage 6: Handover	West Coast	Bergrivier	2019/03/04	2021/11/22	Equitable share	Transport Infrastructure	Individual Project	288 255	262 189	3 000	-	-
51	C1102 PRMG Reseal Windmeul	Stage 5: Works	Cape Winelands	Drakenstein	2020/01/23	2022/04/10	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	279 420	219 090	23 000	-	-
52	C1103 Reseal Grootriver and Bloukrans	Stage 5: Works	Garden Route	Bitou	2021-07-26	2023-02-17	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	98 500	11 087	78 000	2 000	-
53	C1090.1 N7 Bosmansdam-Potsman	Stage 6: Handover	City of Cape Town	City of Cape Town	2018/12/10	2021/06/18	Equitable share	Transport Infrastructure	Individual Project	229 840	241 638	3 000	-	-
54	C1095 Vredenburg - Saldanha	Stage 6: Handover	West Coast	Saldanha Bay	2020/11/02	2021/06/30	Equitable share	Transport Infrastructure	Individual Project	25 345	27 477	1 000	-	-
55	C1119 Replace Bridges Structures in Tesselaarsdal area	Stage 5: Works	Overberg	Theewaterskloof	2022/02/08	2023/02/09	Equitable share	Transport Infrastructure	Individual Project	24 675	-	16 000	500	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
56	C1094 Redelinghuys	Stage 6: Handover	West Coast	Cederberg	2020/01/28	2021/08/27	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	88 486	78 305	1 000	-	-
57	C1148 Reseal Knysna Lagoon Road N2 TR1/1 & MR347	Stage 5: Works	Garden Route	Knysna	2021-11-08	2022-11-07	Equitable share	Transport Infrastructure	Individual Project	77 470	717	-	1 000	-
58	C1115 PRMG Eersterivier Somerset west Reseal	Stage 5: Works	City of Cape Town	City of Cape Town	2021-03-15	2022-03-21	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	98 851	74 692	2 000	-	-
59	C1037.1 Prince Albert Road Reseal	Stage 6: Handover	Central Karoo	Prince Albert	2021/04/13	2021/11/12	Equitable share	Transport Infrastructure	Individual Project	8 213	4 433	500	-	-
60	C1000 Stanford-Gansbaai	Stage 5: Works	Overberg	Overstrand	2022/06/01	2025/02/01	Equitable share	Transport Infrastructure	Individual Project	438 000	17 073	130 000	120 000	110 000
61	C838.6 Caledon - Sandbaai	Stage 5: Works	Overberg	Overstrand	2021-09-08	2022-12-08	Equitable share	Transport Infrastructure	Individual Project	123 733	12 629	93 790	2 000	-
62	C1091.1 Aston - Swellendam	Stage 6: Handover	Cape Winelands	Langeberg	2020/11/12	2021/07/07	Equitable share	Transport Infrastructure	Individual Project	64 813	14 574	1 000	-	-
63	C1142 Rehab Simondium Reseal	Stage 3: Design Development	Cape Winelands	Drakenstein	2023/10/01	2025/06/01	Equitable share	Transport Infrastructure	Individual Project	168 000	-	-	40 000	120 000
64	C1124 Reseal Herbertdale Albertina	Stage 5: Works	Garden Route	Hessequa	2021-05-01	2022-03-14	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	91 011	61 331	3 000	-	-
65	C1101 Reconstruct Walboomskraal	Stage 2: Concept/Feasibility	Garden Route	George	2024/10/01	2025/10/01	Equitable share	Transport Infrastructure	Individual Project	105 000	-	-	-	40 000
66	C1116 PRMG Reseal Wolseley - Ceres - Touwsrivier	Stage 3: Design Development	Cape Winelands	Witzenberg	2023/02/01	2025/04/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	268 000	-	-	140 000	118 000

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
67	C1123 Reseal Beaufort west-Willowmore	Stage 6: Handover	Central Karoo	Beaufort West	2021/01/26	2022/01/06	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	52 964	51 487	3 000	-	-
68	C1104 PRMG Reseal Of Meirings port	Stage 5: Works	Central Karoo	Prince Albert	2022-04-04	2023-07-04	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	105 638	4 738	80 000	2 000	-
69	C1125 PRMG Riversdal ladismith	Stage 4: Design Documentation	Garden Route	Kannaland	2022/11/01	2024/06/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	155 000	-	-	125 000	5 000
70	C1143 PRMG Reseal Ashton-Swellendam, N2-Zuurbraak, Barrydale-Montagu & various DR`s & OP`s (66km)	Stage 5: Works	Overberg	Swellendam	2022/02/21	2023/11/21	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	111 720	-	95 000	15 000	2 000
71	C749.2 Reconstruct Paarl-F/hoek	Stage 4: Design Documentation	Cape Winelands	Drakenstein	2022/11/01	2025/12/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	310 000	-	25 000	130 000	130 000
72	C1202 Rehab/reseal MR264 Swellendam - Bredasdorp (38,5km)	Stage 2: Concept/ Feasibility	Overberg	Cape Agulhas	2024/01/01	2025/05/01	Equitable share	Transport Infrastructure	Individual Project	125 000	-	-	22 605	95 158
73	C1025.4 N1 Reseal	Stage 6: Handover	City of Cape Town	City of Cape Town	2020/12/09	2021/08/03	Equitable share	Transport Infrastructure	Individual Project	79 559	64 951	2 000	-	-
74	C1082.1 Reseal Malbery Hermon	Stage 6: Handover	West Coast	Swartland	2021/02/12	2021/06/18	Equitable share	Transport Infrastructure	Individual Project	19 581	19 254	1 000	-	-
75	C1116 Reseal Wolseley - Ceres - Touwsrivier Wolseley Ceres	Stage 3: Design Development	Cape Winelands	Witzenberg	2023/02/01	2025/04/01	Equitable share	Transport Infrastructure	Individual Project	268 000	-	10 000	-	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration Date: Start Note 1	Project duration Date: Finish Note 2	Source of funding	Budget programme name	Delivery Mechanism	Total project cost R'000	Total Expenditure (until 31 March 2022) R'000	2022/23 R'000	2023/24 R'000	2024/25 R'000
76	C1148 PRMG Reseal Knysna Lagoon Road (N2) 4,39km TR1/1 & MR347	Stage 5: Works	Garden Route	Knysna	2021-09-21	2022-09-22	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	77 470	4 086	70 000	-	-
77	C1144 Reseal Riebeek west	Stage 5: Works	West Coast	Swartland	2021-09-21	2022-09-22	Equitable share	Transport Infrastructure	Individual Project	38 540	10 199	15 000	1 000	-
78	C1146 PRMG Barrington ,old Kynsna &Wilderness	Stage 2: Concept/Feasibility	Garden Route	Knysna	2023/07/01	2024/05/01	Provincial Roads Maintenance Grant	Transport Infrastructure	Individual Project	68 000	-	-	55 000	13 000
Sub-total: Own Funds and Provincial Roads Maintenance Grant										10 682 604	3 821 142	1 985 811	1 835 123	1 670 338
TOTAL: REHABILITATION, RENOVATIONS AND REFURBISHMENTS										**10 682 604**	**3 821 142**	**1 985 811**	**1 835 123**	**1 670 338**
4. UPGRADING AND ADDITIONS														
Own Funds and Provincial Roads Maintenance Grant														
1	C1025 Wingfield i/c	Stage 2: Concept/Feasibility	City of Cape Town	City of Cape Town	2023/10/01	2028/04/01	Equitable share	Transport Infrastructure	Individual Project	600 000	5000	-	44 175	95 000
2	C964.2 Mossel Bay- Hartenbos AMP & upgrading Package 2	Stage 5: Works	Garden Route	Mossel Bay	2022/06/01	2025/02/01	Equitable share	Transport Infrastructure	Individual Project	344 313	-	110 000	140 000	95 000
3	C964.3 Mossel Bay- Hartenbos AMP & upgrading Package 3	Stage 2: Concept/Feasibility	Garden Route	Mossel Bay	2025/02/01	2026/04/01	Equitable share	Transport Infrastructure	Individual Project	85 000	-	-	-	10 000
4	Wansbek DM	Stage 2: Concept/Feasibility	Cape Winelands	Langeberg	2024/11/01	2026/03/30	Equitable share	Transport Infrastructure	Individual Project	60 000	-	-	-	28 000
5	Slangrivier DM	Stage 5: Works	Garden Route	Hessequa	2021/05/10	2022/05/30	Equitable share	Transport Infrastructure	Individual Project	60 802	57 169	1 000	-	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration Date: Start Note 1	Project duration Date: Finish Note 2	Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
										R'000	R'000	R'000	R'000	R'000
6	DM Upgrades	Packaged Programme	Western Cape	Western Cape	2023/04/01	2025/04/01	Equitable share	Transport Infrastructure	Individual Project	50 000	-	-	5 000	45 000
7	Expropriation	Packaged Programme	Western Cape	Western Cape	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Individual Project	36 108	7 958	9 000	9 350	10 000
8	Draaiberg DM	Stage 5: Works	Overberg	Theewaterskloof	2022/05/01	2023/07/02	Equitable share	Transport Infrastructure	Individual Project	115 490	-	70 000	44 000	2 000
9	C733.5 Mariners Way	Stage 3: Design Development	City of Cape Town	City of Cape Town	2023/10/01	2026/02/01	Equitable share	Transport Infrastructure	Individual Project	210 000	13 252	-	40 000	100 000
10	Design Fees Upgrade	Packaged Programme	Western Cape	Western Cape	2016/04/01	2025/04/01	Equitable share	Transport Infrastructure	Individual Project	413 000	220 529	59 000	62 000	71 000
11	Buffeljagsbaai DM	Stage 5: Works	Overberg	Overstrand	2021/03/05	2023/03/30	Equitable share	Transport Infrastructure	Individual Project	27 000	41 204	10 000	-	-
12	C1047.2 Maalgaten River	Stage 5: Works	Garden Route	George	2021/02/08	2022/08/05	Equitable share	Transport Infrastructure	Individual Project	46 500	31 480	8 000	-	-
13	Van Rhynsdorp Surface Urionskraal	Stage 2: Concept/Feasibility	West Coast	Matzikama	2024/10/01	2026/06/01	Equitable share	Transport Infrastructure	Individual Project	47 000	-	-	-	39 000
14	Vredenburg - Stompneusbaai WC DM	Stage 5: Works	West Coast	Saldanha Bay	2020/10/01	2024/03/30	Equitable share	Transport Infrastructure	Individual Project	196 000	69 978	39 000	37 000	-
15	Nuy station DM	Stage 3: Design Development	Cape Winelands	Breede Valley	2023/04/01	2023/10/01	Equitable share	Transport Infrastructure	Individual Project	20 000	-	-	20 000	-
16	Rondevlei	Stage 5: Works	Garden Route	George	2022/02/17	2023/04/17	Equitable share	Transport Infrastructure	Individual Project	59 148	39 015	52 000	1 000	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration Date: Start Note 1	Date: Finish Note 2	Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
										R'000	R'000	R'000	R'000	R'000
17	Surface Ouplaas/De Hoop DM	Stage 2: Concept/Feasibility	Overberg	Cape Agulhas	2023/11/01	2026/03/30	Equitable share	Transport Infrastructure	Individual Project	87 000	-	-	30 000	32 000
18	Slangrivier construct causeway	Stage 5: Works	Garden Route	Hessequa	2021/05/10	2023/03/30	Equitable share	Transport Infrastructure	Individual Project	6 000	-	6 000	-	-
19	C846 Plettenberg Bay Surface 4,88km to Wittedrift	Stage 3: Design Development	Garden Route	Bitou	2023/07/01	2025/03/30	Equitable share	Transport Infrastructure	Individual Project	100 000	-	-	30 000	70 000
20	Die Straat (Rawsonville)	Stage 4: Design Documentation	Cape Winelands	Breede Valley	2022/07/01	2023/10/01	Equitable share	Transport Infrastructure	Individual Project	4 000	-	2 000	2 000	-
21	Robertson-Lange Valley	Stage 1: Initiation/ Pre-feasibility	Cape Winelands	Langeberg	2021/05/10	2022/05/30	Equitable share	Transport Infrastructure	Individual Project	7 000	-	-	7 000	-
22	C974.1 Safety Improvements R44 Phase 1 - Winery I/C	Stage 2: Concept/Feasibility	Cape Winelands	Stellenbosch	2023/07/01	2026/01/04	Equitable share	Transport Infrastructure	Individual Project	195 000	-	-	-	65 000
23	Drakenstein DM	Stage 2: Concept/Feasibility	Cape Winelands	Drakenstein	2024/01/01	2024/10/01	Equitable share	Transport Infrastructure	Individual Project	13 000	-	-	5 000	8 000
24	C1025.1 AFR Wingfield i/c	Stage 5: Works	City of Cape Town	City of Cape Town	2021-07-30	2024-01-29	Equitable share	Transport Infrastructure	Individual Project	260 000	24 534	135 000	75 000	5 000
25	C1038 Postdam & Melkbos	Stage 2: Concept/Feasibility	City of Cape Town	City of Cape Town	2024/01/01	2026/04/01	Equitable share	Transport Infrastructure	Individual Project	240 000	520	-	20 000	120 000
26	C1102.1 Dual MR201 N1 to Kliprug Rd	Stage 5: Works	Cape Winelands	Drakenstein	2022/06/01	2024/03/30	Equitable share	Transport Infrastructure	Individual Project	156 192	-	80 000	80 000	3 000
27	MR 561 Access road to IDZ	Stage 5: Works	West Coast	Saldanha Bay	2022/01/01	2023/03/30	Equitable share	Transport Infrastructure	Individual Project	12 000	-	12 000	-	-

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration: Date: Start Note 1	Project duration: Date: Finish Note 2	Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
										R'000	R'000	R'000	R'000	R'000
28	C975.3 Dual section MR238	Stage 2: Concept/Feasibility	West Coast	Saldanha Bay	2024/08/01	2025/10/01	Equitable share	Transport Infrastructure	Individual Project	128 000	-	-	-	73 955
29	Fancourt DM	Stage 3: Design Development	Garden Route	George	2022/08/01	2024/03/30	Equitable share	Transport Infrastructure	Individual Project	62 000	-	24 000	38 000	-
30	Boontjieskraal DM	Stage 5: Works	Overberg	Theewaterskloof	2020/06/01	2023/03/30	Equitable share	Transport Infrastructure	Individual Project	60 000	8 493	16 000	-	-
Sub-total: Own Funds and Provincial Roads Maintenance Grant										3 700 553	519 132	633 000	689 525	871 955
TOTAL: MAINTENANCE AND REPAIRS										**3 700 553**	**519 132**	**633 000**	**689 525**	**871 955**
5. INFRASTRUCTURE TRANSFERS – CURRENT														
Own Funds														
1	Financial assistance to municipalities for maintenance of Transport Infrastructure (CUR)	Packaged Programme	Western Cape	Western Cape	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	40 000	15 896	4 000	4 000	4 000
TOTAL: INFRASTRUCTURE TRANSFERS - CURRENT										**40 000**	**15 896**	**4 000**	**4 000**	**4 000**
6. INFRASTRUCTURE TRANSFERS – CAPITAL														
Own Funds														
1	Financial assistance to municipalities for maintenance of Transport Infrastructure (CAP)	Packaged Programme	Western Cape	Western Cape	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	90 000	19 781	-	16 000	17 000

Summary of details of expenditure for infrastructure by category - Programme 3 Transport Infrastructure														
No.	Project name	Project status	District Municipality	Local Municipality	Project duration		Source of funding	Budget programme name	Delivery Mechanism	Total project cost	Total Expenditure (until 31 March 2022)	2022/23	2023/24	2024/25
					Date: Start Note 1	Date: Finish Note 2				R'000	R'000	R'000	R'000	R'000
2	Financial assistance to municipalities for construction of Transport Infrastructure (CAP)	Packaged Programme	Western Cape	Western Cape	2015/04/01	2025/04/01	Equitable share	Transport Infrastructure	Packaged program	400 000	280 600	27 650	7 000	3 000
TOTAL: INFRASTRUCTURE TRANSFERS - CAPITAL										**490 000**	**300 381**	**27 650**	**23 000**	**20 000**
TOTAL INFRASTRUCTURE										**23 226 560**	**9 207 486**	**3 562 810**	**3 749 504**	**3 888 011**

Note 1: Site handover/commencement of construction - date of letter of acceptance.
Note 2: Construction completion date (take over date) - practical completion date.

Appendix M – Job creation estimates

The job creation estimates are for the Maintenance Programme. The estimates presented in the table for the 2021/22 financial year below were collected 20 March 2022.

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1037.01	Construction of groynes in the Swart River adjacent to bridge No. 2704 along TR34/1 between Prince Albert road and Prince Albert	FLOOD DAMAGE	COMPLETED	2021/04/13	2021/12/10	R7 129 321,34	26	14	16
C1053.06	Flood Damage Repairs on MR309 in Seweweekspoort - Central Karoo/Lainsburg - (Hatch)	FLOOD DAMAGE	COMPLETED	2019/01/14	2021/06/14	R45 037 232,96	27	15	16
C1183.01	Repair and Replacement of Bridge and Large Culvert Structures near Beaufort West	FLOOD DAMAGE	TENDER/AWARD	2022/03/15	2023/01/15	R29 120 300,00	20	11	12
C1155.03	Emergency Flood Damage Repairs on MR282,MR288 and MR289 near tributaries of the Bree Rivier	FLOOD DAMAGE	CONSTRUCTION	2021/10/13	2022/06/13	R19 748 438,25	61	33	36
C1158.01	Emergency Flood Damage Repairs on MR282 and DR01306 near Tributaries of the Riviersonderend	FLOOD DAMAGE	CONSTRUCTION	2021/10/20	2022/09/21	R36 348 395,00	91	50	54
C1097	Periodic Maintenance on MR535 - Laaiplek km(24.00) to Elandsbaai km (65.37)	REHABILITATION	COMPLETED	2019/03/04	2021/11/22	R288 255 990,43	133	73	80
C1009	Rehabilitation of a section of divisional road 1111 between Main Road 217 and Kalbaskraal	REHABILITATION	COMPLETED	2019/01/08	2021/08/25	R81 901 649,91	27	15	16
C1094	Rehabilitation of MR531 km 76.0 to km 92.6 Elandsbaai and Periodic Maintenance of MR540 km 0.0 to km 12.4 Leipoldtville	REHABILITATION	COMPLETED	2020/01/28	2021/09/16	R88 485 916,71	56	31	34

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C0838.06	Rehab & Reseal of various sections on MR269 between Hemel-en-Aarde and Sandbaai, and Geometric improvements	REHABILITATION	CONSTRUCTION	2021/09/08	2023/01/15	R128 537 174,40	67	37	40
C0914	Rehabilitation of MR168 between Annandale Road and Polkadraai	REHABILITATION	CONSTRUCTION	2022/01/24	2024/01/24	R265 458 048,46	21	12	13
C1100	Periodic Maintenance on TR1/2, TR1/3, TR44/1, TR88/1, DR1834, MR401 AND MR402 – UNIONDALE AREA	RESEAL	COMPLETED	2019/08/13	2021/06/23	R183 454 348,58	371	204	223
C1090.01	The periodic maintenance of TR11/1 (Route N7) between Bosmansdam (km 2.00) and Potsdam (km 9.50)	RESEAL	COMPLETED	2018/12/10	2021/07/26	R229 840 048,97	159	87	95
C1025.04	Periodic Maintenance of TR00901 (N1), including repair of failures, resurfacing and maintenance of ancillaries	RESEAL	COMPLETED	2020/12/09	2021/12/15	R81 821 532,36	122	67	73
C1095	Periodic Maintenance on MR238 - Vredenburg to Saldanha	RESEAL	COMPLETED	2020/11/02	2021/07/01	R25 289 770,61	51	28	31
C1091.01	Replacement Contract - Periodic Maintenance on TR32/1, MR287 and MR288, Ashton to Swellendam - Jan Harmansgat to Bonnievale	RESEAL	COMPLETED	2020/11/12	2021/07/07	R64 813 321,84	18	10	11
C1093.01	Replacement Contract - Periodic Maintenance on TR30/1 Langhoogte to Villiersdorp, TR30/2 Villiersdorp to Worcester	RESEAL	COMPLETED	2020/11/20	2021/05/07	R32 459 666,46	66	36	40
C1082.01	Replacement Contract - Periodic Maintenance on TR24/1 - Malmesbury to Hermon	RESEAL	COMPLETED	2021/02/12	2021/09/10	R19 581 668,72	40	22	24
C1123	Periodic Maintenance on TR35/1 km 2.59 to km 58.0 - Beaufort West to Aberdeen	RESEAL	COMPLETED	2021/01/26	2022/01/14	R53 129 095,10	107	59	64

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1183	Periodic Maintenance of TR03305	RESEAL	CONSTRUCTION	2021/09/07	2023/03/20	R284 112 355,65	62	34	37
C1148	Periodic Maintenance of TR00210 - Knysna	RESEAL	CONSTRUCTION	2021/11/08	2022/11/07	R77 470 000,00	63	35	38
C1153	Periodic Maintenance of TR03104 - Barrydale to Ladismith	RESEAL	CONSTRUCTION	2021/10/08	2022/12/12	R87 328 378,83	12	6	7
C1143	Periodic Maintenance of TR03201, TR03103, TR06501, DR01354, DR01352, OP06074, OP06072 and OP06069 - Swellendam	RESEAL	TENDER/AWARD	2022/02/21	2023/11/23	R111 720 675,53	19	10	11
C1151	Periodic Maintenance of MR00177 - Blackheath to Stellenbosch	RESEAL	TENDER/AWARD	2022/03/01	2022/10/31	R68 209 987,95	50	28	30
C1152	Periodic Maintenance of TR07701 - Atlantis to Ysterfontein	RESEAL	CONSTRUCTION	2022/01/14	2022/12/10	R53 700 000,00	47	26	28
C1124	Periodic Maintenance on MR334, MR337, DR1532 and DR1525 - Herbertsdale/Gouritsmond Area	RESEAL	CONSTRUCTION	2021/05/03	2022/03/14	R89 666 684,12	157	86	94
C1144	Periodic Maintenance of MR00227 - Riebeeck Wes to Moorreesburg	RESEAL	CONSTRUCTION	2021/09/21	2022/09/22	R44 494 873,12	54	30	32
C1103	Periodic Maintenance on TR2/12 km 14.14 to km 37.25 from Kurland to Eastern Cape Border (Bloukrans Pass)	RESEAL	CONSTRUCTION	2021/07/19	2023/02/17	R103 637 344,95	48	26	29
C1088.01	Periodic Maintenance on MR267 - Stanford to (N2) Riviersonderend (km 0.34 to km 50.58)	RESEAL	CONSTRUCTION	2021/10/19	2023/05/19	R140 861 995,55	37	21	22

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1104	Periodic Maintenance on TR33/4 0.0 to km 19.3 De Rust/Klaarstroom, and TR34/2 km 19.0 to km 47.4 Klaarstroom/Prince Albert	RESEAL	TENDER/AWARD	2022/04/01	2023/07/01	R105 638 250,00	95	52	57
C1105	Periodic Maintenance of TR00902 - Du Toitskloof Pass from km 0.21 to km 21.25	RESEAL	TENDER/AWARD	2022/06/01	2023/04/01	R102 576 350,00	30	16	18
C1102	Periodic Maintenance on MR27 and MR201 - Windmeul to Wellington and Bainskloof Pass	RESEAL	CONSTRUCTION	2020/09/03	2022/03/18	R272 436 767,73	270	149	162
C1115	Periodic Maintenance on TR2/1 km 30.92 to km 42.79 between Eerste Rivier and Somerset West	RESEAL	CONSTRUCTION	2021/03/15	2022/03/18	R98 570 593,53	199	109	119
C1149	Periodic Maintenance of TR00202 - Somerset West	RESEAL	CONSTRUCTION	2021/10/20	2022/06/21	R63 275 000,00	65	36	39
C1184	Periodic Maintenance of TR00201	RESEAL	CONSTRUCTION	2021/09/29	2022/10/06	R155 828 897,32	107	59	64
C1114.04	Routine Road Maintenance on Roads in the Yzerfontein South Area	ROUTINE MAINTENANCE	COMPLETED	2018/05/15	2021/05/14	R9 796 293,31	58	32	35
C1114.07	Routine Road Maintenance on Roads in the Elands Bay Area	ROUTINE MAINTENANCE	COMPLETED	2018/05/15	2021/05/14	R23 072 459,41	135	74	81
C1114.02	Routine Road Maintenance on Roads in the Yzerfontein North Area	ROUTINE MAINTENANCE	COMPLETED	2018/05/18	2021/05/17	R18 847 834,97	66	36	40
C1114.03	Routine Road Maintenance on Roads in the Vredendal Area	ROUTINE MAINTENANCE	COMPLETED	2018/05/18	2021/05/17	R9 958 340,38	95	52	57

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1114.06	Routine Road Maintenance on Roads in the Malmesbury North Area	ROUTINE MAINTENANCE	COMPLETED	2018/05/18	2021/05/17	R5 397 601,48	40	22	24
C1114.01	Routine Road Maintenance on Roads in the Porterville West Area	ROUTINE MAINTENANCE	CONSTRUCTION	2018/05/15	2022/03/30	R21 072 130,55	82	45	49
C1114.03R	Routine Road Maintenance on Roads in the Vredendal Area	ROUTINE MAINTENANCE	CONSTRUCTION	2021/05/28	2022/03/30	R2 764 566,41	27	15	16
C1114.05	Routine Road Maintenance on Roads in the Porterville East Area	ROUTINE MAINTENANCE	CONSTRUCTION	2018/05/15	2022/03/30	R16 061 372,96	40	22	24
C1114.10R	Routine Road Maintenance on Roads in the Cape Winelands Area	ROUTINE MAINTENANCE	CONSTRUCTION	2021/09/06	2022/03/06	R2 219 500,00	22	12	13
C1114.06R	Routine Road Maintenance on Roads in the Malmesbury North Area	ROUTINE MAINTENANCE	CONSTRUCTION	2021/05/24	2022/03/30	R3 170 566,69	31	17	19
C1114.02R	Routine Road Maintenance on Roads in the Yzerfontein North Area	ROUTINE MAINTENANCE	CONSTRUCTION	2021/05/25	2022/03/31	R3 079 980,47	30	17	18
C1114.04R	Routine Road Maintenance on Roads in the Yzerfontein South Area	ROUTINE MAINTENANCE	CONSTRUCTION	2021/05/25	2022/03/31	R2 575 547,58	25	14	15
C1114.07R	Routine Road Maintenance on Roads in the Elands Bay Area	ROUTINE MAINTENANCE	CONSTRUCTION	2021/05/24	2022/03/31	R3 654 305,17	36	20	22
C1114.08	Routine Road Maintenance on Roads in the Malmesbury South Area	ROUTINE MAINTENANCE	CONSTRUCTION	2018/05/18	2022/03/31	R18 410 368,22	135	74	81

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1057.13	Routine Road Maintenance on TR33/1, TR33/2, MR358, DR1671 and DR1680 between Oudtshoorn and Mossel Bay	ROUTINE MAINTENANCE	CONSTRUCTION	2017/05/03	2022/03/31	R23 265 245,97	37	20	22
C1114.18T	Routine Road Maintenance on TR16/08, TR16/09, TR16/10 and MR606 near Murraysberg	ROUTINE MAINTENANCE	CONSTRUCTION	2021/02/16	2022/06/30	R4 064 063,43	32	18	19
C1114.19	Routine Road Maintenance on TR33/4 and DR1723 including cleaning and maintenance of rest areas in Meiringspoort	ROUTINE MAINTENANCE	CONSTRUCTION	2019/09/01	2022/08/31	R19 737 169,03	94	52	56
C1114.10T	Maintenance and Safety Services on TR02201, MR00201, MR00310, DR1398 in Cape Winelands South	ROUTINE MAINTENANCE	CONSTRUCTION	2021/04/16	2021/08/15	R998 969,52	10	6	6
C1114.09	Routine Road Maintenance on Roads in the Cape Winelands North Area	ROUTINE MAINTENANCE	CONSTRUCTION	2019/01/11	2022/01/31	R11 893 284,97	117	64	70
C1114.11	Routine Road Maintenance on Roads in the Cape Winelands West Area	ROUTINE MAINTENANCE	CONSTRUCTION	2019/01/11	2022/01/31	R11 836 676,56	117	64	70
C1114.12T	Maintenance and Safety Services on Roads MR00267, MR00269 and MR00279 in the Overberg Region	ROUTINE MAINTENANCE	CONSTRUCTION	2021/03/11	2022/01/31	R3 243 418,29	32	18	19
C0818.01	Rehab TR31/2 - Ashton/Montagu	UPGRADE	CONSTRUCTION	2019/05/02	2022/02/25	R511 105 295,25	600	330	360
C1008	Upgrade concrete road DR01688 between Calitzdorp Spa turnoff and Oudtshoorn	UPGRADE	CONSTRUCTION	2021/11/08	2024/05/07	R187 856 445,65	33	18	20
C0964.02	Upgrade of TR33/1 at Beach Road Boulevard West (km 10.27) and Garret Street (km 13.05)	UPGRADE	TENDER/AWARD	2022/05/01	2025/05/03	R350 000 000,00	61	34	37

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1000.01	Rehab TR02802 between Hermanus & Stanford	UPGRADE	CONSTRUCTION	2019/01/25	2022/03/15	R472 924 523,39	106	58	64
C1011	Upgrade MR00281 along Theewaterskloof dam between Rooihoogte & Draaiberg	UPGRADE	TENDER/AWARD	2022/05/01	2023/07/02	R115 500 000,00	0	0	0
C1102.01	Support Services - MR201(R301) between the N1 (Paarl) and the R45 (Wemmershoek)	UPGRADE	TENDER/AWARD	2022/05/01	2023/09/01	R160 000 000,00	0	0	0
C0851	Upgrade DR1609 - Rondevlei	UPGRADE - NEW ROAD	TENDER/AWARD	2022/02/17	2023/02/16	R67 779 844,91	35	19	21
C1025.01	Upgrade of Refinery Interchange on TR11/1 (km 4.1)	UPGRADE - NEW STRUCTURE	CONSTRUCTION	2021/07/30	2024/02/17	R290 550 600,00	60	33	36
C1047.02	The widening of Bridge No. 2221 over the Maalgate River at 15.1km on TR2/9	UPGRADE - NEW STRUCTURE	COMPLETED	2021/02/08	2022/09/06	R48 715 832,02	68	38	41
C1119	The Replacement of Structures on DR1218, DR1252 and OP4032 – Overberg District Municipality	UPGRADE - NEW STRUCTURE	CONSTRUCTION	2022/02/08	2023/02/09	R24 675 325,18	12	7	7
C1114.13	Vegetation Maintenance on Roads in the Vredendal Area	VEGETATION MANAGEMENT	CONSTRUCTION	2019/05/03	2022/05/02	R11 025 531,85	37	20	22
C1114.14	Vegetation Maintenance on Roads in the Malmesbury Area	VEGETATION MANAGEMENT	CONSTRUCTION	2019/05/03	2022/05/02	R11 920 997,38	52	29	31
C1114.15	Vegetation Maintenance on Roads in the Porterville Yzerfontein Area	VEGETATION MANAGEMENT	CONSTRUCTION	2019/05/03	2022/05/02	R11 804 432,46	66	36	40

CONTRACT NO.	CONTRACT DESCRIPTION	SCOPE	PHASE	START DATE	END DATE	ESTIMATED VALUE	Projected Work Opportunities created	Projected Number of Work Opportunities (youth)	Projected Number of Work Opportunities (women)
C1114.16	Vegetation Maintenance on Roads in the Porterville Area	VEGETATION MANAGEMENT	CONSTRUCTION	2019/05/03	2022/05/02	R12 684 366,92	66	36	40
C1114.17	Vegetation Maintenance on Roads in the Elands Bay Area	VEGETATION MANAGEMENT	CONSTRUCTION	2019/05/03	2022/05/02	R8 465 225,04	30	17	18
C1057.17	Vegetation Management on Roads in the Central Karoo DM Area	VEGETATION MANAGEMENT	COMPLETED	2018/06/12	2021/08/31	R8 889 768,92	40	22	24
C1057.06	Vegetation Management on Roads in the Cape Winelands East Area	VEGETATION MANAGEMENT	COMPLETED	2017/10/06	2021/07/31	R13 957 083,41	30	17	18
C1057.07	Vegetation Management on Roads in the Cape Winelands West Area	VEGETATION MANAGEMENT	COMPLETED	2017/10/23	2021/07/31	R14 774 942,70	30	17	18
C1057.16	Vegetation Management on Roads in the Overberg Area	VEGETATION MANAGEMENT	COMPLETED	2018/05/29	2021/07/31	R10 494 723,69	30	17	18
C1114.20	Vegetation Maintenance on Roads in the Cape Winelands North Area	VEGETATION MANAGEMENT	COMPLETED	2019/11/28	2021/07/31	R4 076 333,70	30	17	18
C1114.21	Vegetation Maintenance on Roads in the Cape Winelands South Area	VEGETATION MANAGEMENT	COMPLETED	2019/11/28	2021/07/31	R5 115 387,29	30	17	18
C1114.22	Vegetation Maintenance on Roads in the Overberg Area	VEGETATION MANAGEMENT	COMPLETED	2019/11/28	2021/07/31	R6 672 474,09	30	17	18
TOTALS							**5 486**	**3 017**	**3 292**

Appendix N – Contractor development training

Status for the entries is off-site.

The estimates presented in the table for the 2021/22 financial year below were collected on the 25 March 2022.

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
C0818.01	Haw & Inglis Civil Engineering	9CE	R393 007 496,09	Mega Bouers	REHABILITATION OF 13,4 KM OF TR31 FROM ASHTON TO MONTAGU THROUGH COGMANSKLOOF	R110 000 000,00	R109 000 000,00
				Suku Nikezela CC			
				ALC Projects			
				Falber Civils			
				Imvusa Trading			
				Hydrocape			
				Suku Nikezela			
				Zimele Civil and Plant Hire			
C1095	Civils 2000 (Pty) Ltd	9CE	R25 345 000,01	Silver Solutions	Traffic management	R3 041 580,24	R3 041 580,24
				Noord Civils –	Seal sub-contractor		
				TSB Safety Cons	Safety Consultant		
C1144	RoadMac Surfacing Cape (Pty) Ltd	9CE	R38 540 248,32	Casswan Trading	Traffic management	R4 714 899,80	R1 105 003,40
				SF Solutions	Security services		
				I-XE I-Xara Projects	Clearing open drains		
				Herrie DIY (Pty)Ltd	Layerworks		
				Wilshir Projects (Pty) Ltd	Edgebeam		
C1151	Civils 2000	9CE	R63 450 000,00	ERG Construction	Grass Cutting	R250 000,00	R0,00
				KC Traffic Services	Traffic Accommodation	R1 673 661,00	R0,00
				CPG Services and Supplies	Ancillary concrete works	R248 222,99	R0,00
				OTAWC Trucking Group	Haulage	R1 488 000,00	R0,00
				Golden Rewards	Guardrails	R577 804,42	R0,00
				Alert Development	Fencing	R969 000,00	R0,00
				Centremark	Roadmarking	R1 449 200,00	R0,00
C1008	AmandlaGCF Construction CC	8CE PE	R178 939 563,00	Subcontractors to be appointed	Accommodation of traffic & TSO	R14 326 500,00	R0,00
					Temporary culverts	R421 625,00	R0,00
					Prefabricated culverts	R2 569 025,00	R0,00
					Concrete kerbing & channeling	R1 286 485,00	R0,00
					Concrete kerbing and channeling	R1 286 485,00	R0,00
					Gabions	R1 359 450,00	R0,00
					Guardrails	R1 239 685,00	R0,00
					Fencing	R2 387 180,00	R0,00
					Fencing	R2 387 180,00	R0,00

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
C1100	Actophambili Roads JV	8CE	R150 624 017,40	Ibeghi Civils (Pty) Ltd	Concrete works for minor culvert head and wing walls	R1 466 766,04	R1 140 874,12
				Ibeghi Civils (Pty) Ltd	Guardrails	R4 346 633,66	R4 346 633,66
C1183	Tau Pele Construction (Pty) Ltd	9CE	R254 500 000,00	CPG Services and Supplies (Pty) Ltd	Sub-soil drains	R2 082 339,75	R209 170,38
				Suku Nikezela (Pty) Ltd	Sub-soil drains	R2 082 339,75	R288 785,60
				KC Traffic Services (Pty) Ltd	Traffic accommodation	R20 303 396,11	R958 811,54
C1000.01	Haw and Inglis Civil Engineering	9CE	R363000000,00	Wezlo (Pty) Ltd	Kerbs and channels, edgebeams, culverts	R5 033 559,50	R4 726 187,61
				JC Civils	Concrete Lined Drains, Subsoils, Storm water, Culerts	R9 749 828,00	R9 749 828,00
				PS Cleaning and Clearing	Trimming, Guardrials	R1 745 647,06	R1 745 647,06
				N & N	Edgebeams	R102 467,88	R102 467,88
				Isukeyahlala	Sealwork and Slurry	R2 805 603,91	R2 789 448,44
				Face of Africa	Block paving, Edge beams, sealwork	R426 567,20	R359 714,20
				Madlisa and Sons Construction and Projects	Sidewalk edging	R519 848,22	R519 848,22
				Noxy Cleaning and Projects	Asphalt Sidewalks	R277 838,34	R277 838,34
				Pemzo	Cement Packing	R1 298 448,92	R1 270 845,72
				Women of Rock n Stone	Minor Concrete Works	R1 762 776,26	R1 762 776,26
				Forfeb Projects	Erosion Protection, Minor Concrete works	R14 095 773,54	R12 912 570,74
				Greenfern Trade	Concrete Lined Drains, Minor concrete works	R9 372 646,14	R9 093 128,64
				Mdyosi Construction	Temporary culverts, Subsoils, stormwater, concrete lined drains	R3 360 628,90	R3 360 628,90
				JP Lynch	Concrete Lined Drains	R10 976 149,45	R10 516 674,54
				Keyona Civils	Concrete Lined Drains, Minor concrete works	R914 964,94	R914 964,94
C1091.01	Actophambili Roads (Pty) Ltd	8CE	R62 003 920,00	AA Services	Road signs	R290 675,00	R122 330,00
				AC Dot Services	Edge Beams, Subsoil Drains, Concrete Lined Side Drains and Stone Pitching	R290 675,00	R208 057,96
				KC Traffic Services	Traffic Accommodation	R2 343 975,99	R2 343 975,99
				Ludify	Fencing, Edge Beams, Cleaning of Site and Stone Pitching	R579 530,44	R579 530,44
				Molwena	Edge Beams, Culvert Head- and Wing Walls and Stone Pitching	R290 675,00	R119 594,23

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
				Moula Construction	Edge beams and Culvert Head- and Wing Walls	R290 675,00	R26 801,25
				Rodmas Trading and Projects	Subsoil Drains, Concrete Lined Side Drains and Edge Beams	R3 620 621,08	R40 929,44
				Versatec Group	Subsoil Drains, Concrete Lined side Drains and Edge Beams	R6 581 720,54	R6 581 720,54
C1102	BASELINE CIVIL CONTRACTORS	9CE	R264 435 597,48	5P'S CONSTRUCTION	Concrete lined drains	R9 833,00	R9 833,00
				ALMAGATE PROJECTS	Covid Control	R360 000,00	R248 206,45
				AMAJOINTS	Bridge Joints	R738 145,74	R738 145,74
				CPG CONSTRUCTION	Concrete lined drains	R282 148,55	R282 148,55
				D SQUARED CONSTRUCTION	Armco repairs, patching and gabions	R1 287 308,80	R1 088 296,81
				ESAU CIVILS	Concrete lined drains	R108 734,51	R108 734,51
				GENTIUM (PTY) LTD	Tree felling	R1 503 445,01	R1 503 445,01
				GERNOLIA GROUP	Concrete lined drains	R172 134,00	R172 134,00
				IMVUSA TRADING 1037 CC	Concrete lined drains	R2 650 248,48	R2 391 236,38
				IXP CONSTRUCTION	Macaddam Patches	R620 000,00	R478 368,41
				K20200707137	Concrete lined drains	R38 974,00	R38 974,00
				KLEINHANS CONSTRUCTION	Traffic Accomodation	R17 172 500,00	R15 405 956,19
				KOYISA	Labour Administrator	R11 967 881,25	R10 462 750,27
				MAMBAMBA CIVILS	Civil and Roadworks	R6 351,89	R6 351,89
				MD CIVILS	Civil and Roadworks	R10 600 000,00	R9 219 071,00
				MTC	Civil and Roadworks	R93 899,53	R93 899,53
				NRH CONSTRUCTION	Concrete lined drains	R1 413 151,00	R1 374 990,95
				ONLY 1 CONSTRUCTION	Concrete lined drains	R1 150 000,00	R824 744,09
				SAMAAI CONSTRUCTION	Civil and Roadworks	R1 335 073,70	R1 335 073,70
				SIBANYE CIVIL CONSTRUCTION	Concrete lined drains	R1 400 000,00	R1 025 644,59
				TASJNE & DAVID CONSTRUCTION	Asphalt and surfacing	R800 000,00	R646 363,74
				ZELLIE ZELS PROJECTS & SERVICES	Concrete lined drains	R1 882 789,29	R1 882 789,29
				ALC PROJECTS (TP5)	CIVIL WORKS	R2 779 407,69	R1 617 411,75
				ALMAGATE PROJECTS	CIVIL WORKS	R1 788 032,67	R1 577 738,42
				BRAN U CONSTRUCTION (TP 3)	CIVIL WORKS	R872 929,33	R872 929,33
				BRITLOW CONSTRUCTION (TP 2)	CIVIL WORKS	R4 095 262,04	R3 581 618,81
				CONSTRUCTION PROJECT SOLUTIONS (TP 4)	CIVIL WORKS	R3 564 388,80	R3 202 904,46

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
				JP LYNCH CONSTRUCTION (TP 1)	CIVIL WORKS	R2 980 908,86	R2 853 760,27
				SR CIVIL CONTRACTORS	CIVIL WORKS	R1 620 366,04	R1 452 239,45
C1053.06	Amandla JV	8CE	R32 514 975,82	Golden Reward	Rebar fixing	R500 000,00	R500 000,00
				Aysly Enterprizes	Labour provider	R10 118 582,00	R10 118 582,00
				Afriserv	Landscaping	R1 500 000,00	R1 500 000,00
				Maricks Civils	Concrete	R1 628 757,85	R1 628 757,85
C1090.01	Roadmac Surfacing Cape	9CE	R181 992 290,00	EMPA	Structural works	R24 408 537,93	R24 408 537,93
C1103	Actophambili Roads (PTY) Ltd	8CE	R9 850 000,00	KC Traffic	Traffic Accommodation	R7 656 390,00	R1 939 620,00
					Clear and Grub	R153 000,00	R104 040,00
C1184	Roadmac Surfacing Cape	9CE	R147 150 000,00	EMPA	Structural works	R11 013 980,00	R3 155 707,00
C0838.06	Baseline Civil Contractors	9CE	R123 733 195,57	Ghost security	Security services	R700 000,00	R214 020,00
				Revolution Corp	Labour Administration	R873 560,89	R873 560,89
				KC Traffic Services (Pty) Ltd	Traffic Safety Officer	R8 900 000,00	R2 887 346,38
				Tasjine & David Civils (Pty) Ltd	Slurry + Patchwork + Sealwork	R500 000,00	R259 654,57
				WPH Construction (Pty) LTd	Transport of material (tipper trucks)	R350 000,00	R71 645,00
				Napa Civils (Pty) Ltd	Spreading of Chemical Stabilising Agent	R130 000,00	R25 494,75
C1158.01	Amandla GCF Construction	8 CE PE	R36 348 395,00	P&M Traffic Solutions	Traffic accommodation	R1 530 000,00	R710 667,86
				SHALOTTI SECURITY SERVICES	Security	R166 320,00	R6 720,00
C1094	Baseline Civil Contractors	9CE	R81 811 374,49	KOLOSSIE GENERAL TRADING CC	THE CONSTRUCTION OF STORMWATER STRUCTURES, CONCRETE LINED AND UNLINED DRAINS, EDGEBEAMS, PAVING AND FENCING ON MAIN ROAD 531 ELANDSBAY & MAIN ROAD 540 LEIPOLDVILLE	R1 839 107,00	R1 533 953,00
C1123	Roadmac SC (Pty) Ltd	9CE	R46 055 589,18	Road Traffic Specialist	Traffic Accommodation	R5 200 000,00	R5 200 000,00
				GOB Enterprises (PTY) LTD	Security	R220 000,00	R220 000,00
				Duneco	Picking up surplus construction material	R51 234,00	R51 234,00
				Q & K Projects	Emergency Fence Repairs, Fencing, Cleaning of Structures, Edge Beams	R450 000,00	R450 000,00
				Centremark Roadmarking (PTY) LTD	Line Marking	R2 435 990,00	R2 435 990,00
				De Jager Loodgieter Kontrakteurs (PTY) LTD	Plant Hire, Material Supplies	R48 740,00	R48 740,00

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
				Anchen Civils (PTY) LTD	Cleaning The Road reserve, Cleaning of side drains	R351 500,00	R351 500,00
C1152	Actophambili Roads (Pty) Ltd	8CE	R53 700 000,00	BMF Developers	Site camp establishment	R12 500,00	R12 500,00
				Korah Services	Traffic Accommodation	R1 181 250,00	R236 750,00
				Cleophas Construction and Transport (Pty) Ltd	Route patrol and litter control	R396 875,00	R53 662,00
				Tjeka Training Matters	Site training	R211 361,95	R44 298,00
C1115	Roadmac Surfacing Cape (Pty) Ltd	9CE	R84 249 000,00	LangCon	Traffic Accommodation Head & Wingwalls, Asphalt Transport	R4 400 000,00	R4 040 229,89
				Keyona Civils	Security	R3 200 000,00	R2 878 528,22
				Tjeka	Training Company	R16 928,00	R16 928,00
				SNG Trading	Kerbing	R1 700 000,00	R1 659 249,40
				Cleophas Construction	Kerbing	R1 900 000,00	R1 784 296,16
				SR Civils	Layerworks	R640 000,00	R639 920,79
				ESE Trading	Grass Cutting	R273 888,00	R273 888,00
				Lela Transport	Asphalt Haulage	R388 662,42	R388 662,42
				Ukumaka	Line Marking	R1 400 000,00	R507 410,29
				Westcape Projects	Fencing, Guardrails, Gabions	R2 300 000,00	R1 905 969,27
				Masiqhame Trading	Milling Transport	R300 000,00	R87 146,00
				Road Traffic Specialist	Roadsigns	R450 000,00	R255 222,24
				Lawula Systems	Magnetometers	R185 106 039,00	R185 106 039,00
C1009	Amandla Umzali JV	8CE	R7 329 126,63	Rudco Construction	Move temp. fence	R26 410,41	R26 410,41
				KC Traffic Services (Pty) Ltd	Traffic Control	R2 950 000,00	R2 832 786,00
				Paulse Multigo	Road Materials	R10 198 300,00	R10 198 300,00
				Golden Reward	Fencing	R2 328 370,37	R1 740 000,00
				Cloete Traffic Construction	Open drain excavation	R1 420 200,00	R285 000,00
				Esau Civils & Construction	Grass block inst.	R982 500,00	R982 500,00
				Cleophas Construction and transport	Guard rails	R349 217,05	R303 667,00
				Suku Nikizela	Concrete line drains	R2 781 808,20	R2 781 808,20
				SR Civils	Small Structures	R878 151,00	R492 621,50
				I-XE I-XARA Projects	Grass Block inst.	R1 200 000,00	R1 200 000,00
C1088.01	Actophambili Roads (Pty) Ltd	8CE	R136 943 926,00	KC Traffic Services (Pty) Ltd	Traffic Accommodation	R6 475 245,00	R856 699,34
C1082.01	Civils2000 (Pty) Ltd	9CE	17642049,29	Silver Solutions	Traffic Accommodation, Signage, Concrete Side Drains	R5 228 704,71	R5 228 704,71
				CPG	Concrete Side Drains, Subsoils, Concrete Structures		
				Anzi Plant hire	Plant Hire		
				K AFRIKA	Concrete Side Drains		
				Abupix	Earth Drains, Trimming		

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
				NWC	Concrete Side Drains		
				Fast Track Civils	Concrete Side Drains		
				J Square	Concrete Side Drains		
				Cleophas	Guardrails		
				Alert Development	Concrete Side Drains		
C1148	ACTOPHAMBILI ROADS (PTY) LTD	8CE	R77 470 000,00	KC TRAFFIC SERVICES (PTY) LTD	Traffic Accommodation	R7 000 000,00	R430 807,14
C1025.01	H&I Construction (Pty) Ltd	9CE	R260 300 000,00	Road Traffic Specialist	Traffic Accommodation - NO	R12 833 371,00	R1 513 571,30
				Nube Consulting services	Materials Supplier – No	R2 000 000,00	R108 871,47
				Afriwire and steel	Materials Supplier	R21 313,00	R21 313,00
				Gandaganda plant Hire (pty) Ltd	Plant Hire	R2 500 000,00	R1 227 269,77
				Henmar Hire (H.J.S Roux Trust)	Materials Supplier and Plant Hire	R140 000,00	R6 400,00
				Lourens Roadmarking(Pty) Ltd	Road markings	R850 000,00	R10 610,50
				CAD of Civil engineering	Civil Subcontractor (Laboratory renovations)	R550 000,00	R197 200,89
				Cliad Civil projects	Civil Subcontractor (Site camp setup and exposing existing services)	R250 000,00	R216 685,56
				SJC Tatical Services	Security services	R1 800 000,00	R386 218,48
				Ali Surveys	Surveying services	R330 000,00	R280 000,00
				Global Fueling Systems	Fueling services	R1 766 000,00	R0,00
				Jp Steel	Civil Subcontractor	R350 000,00	R0,00
				Adenco	Electrical subcontractor	R284 899,11	R284 899,11
				Laminin Construction PTY(LTD)	Civil Subcontractor	R70 000,00	R45 758,75
				HDD Africa	Civil Subcontractor	R200 000,00	R190 195,90
				Lllies Sales and Services WC (Pty) Ltd	Materials Supplier	R1 000 000,00	R200 849,60
				T and T Fire & Safety	Materials Supplier	R50 000,00	R10 733,50
				Sizwe Khula Laboratory & Training Services (Pty) Ltd	Materials Supplier	R300 000,00	R122 250,00
				INEXMA 102 (PTY) LTD	Electrical subcontractor	R12 936 312,88	R159 561,81
C1025.04	H&I Construction (Pty) Ltd	9CE	R69 380 000,00	EC Traffic Services Northern	Traffic Accommodation	R2 991 850,25	R2 991 850,25
				Sales Hire	Plant Hire	R15 000,00	R10 244,25
				SJC SECURITY SERVICES (PTY)	Security services	R581 432,60	R581 432,60

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
				Terradrones (Pty) Ltd	Photography	R199 550,00	R199 550,00
				Thabisa Construction & Projects	Civil Subcontractor	R470 859,23	R470 859,23
				Shumba Construction (Pty) Ltd	Plant Hire	R284 982,21	R284 982,21
				STZ CORPORATION (Pty) Ltd	Civil Subcontractor	R406 475,07	R23 257,23
				CENTREMARK ROADMARKING	Road markings	R3 900 000,00	R1 183 400,38
				MASIQHAME TRADING 729	Materials supplier	R2 100 000,00	R416 950,00
C1097	H&I Construction (Pty) Ltd	9CE	R164 200 000,00	EC Traffic Northen Region	Traffic Accommodation	R51 318 246,70	R51 318 246,70
				Mpeke Plant Hire	Plant Hire	R3 048 064,06	R3 048 064,06
				Shumba Construction (Pty) Ltd	Plant Hire	R6 286 349,46	R6 286 349,46
				Vraagoms Project (Pty) Ltd	Construction Subcontractor	R3 751 927,62	R3 751 927,62
				High Speed Projects (Pty) Ltd	Security	R450 000,00	R356 820,46
				Marthine Construction (Pty) Ltd	Civil subcontractor	R1 950 000,00	R0,00
				WC Perway (Pty) Ltd	Civil subcontractor	R900 000,00	R704 323,69
				Masiqhama Trading 729 CC	Plant Hire	R1 814 051,79	R1 814 051,79
C1047.02	Mamlambo Construction	8CE PE	R46 500 000,00	KC Traffic Services	Traffic Accommodation	R3 500 000,00	R2 782 757,63
				MDC Arendse Construction	Formwork, Reinforcing and Concrete Works	R3 500 000,00	R1 026 851,83
C1124	iMvula Roads and Civils	8CE	R77 300 000,00	Magic Moppers Mowers and Maintenance	Concrete Works	R3 400 000,00	R1 008 948,95
				Genela Security Training and Projects	Security	R675 000,00	R625 165,00
				MSE Civils	Gabions, Bridge Joints, Concrete Works	R1 800 000,00	R1 768 605,62
				Nova Civils	Clear and Grub, Culverts and Concrete Works, Stone Work and Road Signs	R1 000 000,00	R788 491,22
				Palm Traffic and Civils	Clear and Grub	R1 100 000,00	R1 090 765,52
				GER Civils	Clear and Grub, Culverts and Concrete Works and Stone Work	R1 000 000,00	R516 143,37
				Ashmey Civils Montague	Traffic Accommodation	R5 800 000,00	R5 505 940,42
				Deb Infra	Culverts and Concrete Works	R1 000 000,00	R855 359,59
				Sofonia Projects	Clear and Grub, Culverts and Concrete Works	R600 000,00	R43 158,25

Project Number	Main Contractor	Contractor CIDB	Tender Amount of Main Contract (Rands)	Subcontractor Name	Description of Service	Estimated Amount for subcontractor services (Rands)	Total Payments to Sub contractor to date (Rands)
				DMD General	Clear and Grub, Culverts and Concrete Works	R610 000,00	R15 695,81
C1093.01	iMvula (Pty) Ltd	8 CE PE	R33 830 000,00	Ashmey Civils (Pty) Ltd, 5 P's Trading (Pty) Ltd, Gernolia Group (Pty) Ltd, WPH Construction (Pty) Ltd, Nova Civils (Pty) Ltd, FG Civils (Pty) Ltd	Periodic Maintenance of TR30 Section 1 and 2	R6 766 000,00	R3 807 640,42
C1037.01	Amandla JV	8CE	R32 514 975.82	Romp projects	Install and construct gabions and concrete erosion pads	R1 625 000,00	R1 674 909,09
				MM Vister Vervoer	Supply gabion stone	R429 400,00	R437 875,00
				Van Rooyen Transport	Transport services	R100 000,00	R127 680,00
C1149	Martin & East (Pty) Ltd	9 CE	R63 275 000,00	RTS Traffic	Accommodation of traffic	R2 318 406,33	R775 005,70
				CL Enterprises	Transport company (haulage of asphalt)	R184 000,00	R126 786,35
				Pots Devco	Kerb installation	R877 450,00	R157 937,41
Totals						**R813 390 721,33**	**R642 218 320,81**

Appendix O – Standard NDOT and WCG Table of contents comparison

Standard NDOT RAMP Table of contents	WCG Reference Guide
1 INTRODUCTION	1 Introduction (Page 1)
1.1 Background	1.1 Background (Page 2)
1.2 Goals and Objectives of RAMP	1.2 Goals and objectives of the RAMP (Page 3)
1.3 Plan Framework	1.3 RAMP framework (Page 5)
1.4 Planning Approach and Methodology	1.4 The asset management approach to planning (Page 7)
1.5 Gap Analysis of Asset Management Maturity Level	Appendix C
2 THE ROAD NETWORK	2 The Road Network (Page 24)
2.1 The Provincial Road Network	2.4 Road carriageway length (Page 26)
2.2 The Provincial Bridge and Major Culverts	2.8 Structural data (Page 31)
3 LEVEL OF SERVICE	3 Level of Service (Pages 33 - 35)
3.1 Departmental Norms and Standards	
3.2 Current Level of Service	
3.3 Desired Level of Service	
3.4 Usage Data	
3.5 Condition Assessment Data	
3.6 Minimum Condition and Function Levels	
4 CURRENT ASSET CONDITION AND PERFORMANCE	4 Situational Analysis (Page 36)
4.1 Network Inventory	4.1 Inventory Data (Page 36)
4.2 Usage of Assets	4.2 Usage of the Assets (Page 40)
4.3 Engineering Condition of Assets	4.3 Engineering Condition of the Assets (Page 43)
4.4 Paved Roads	4.3.2 Visual condition of the paved road network (Page 43)
4.5 Pavement Condition per District	4.3.3 Visual condition of paved per district municipality (Page 46)
4.6 VCI of the Paved Road Network per District	4.3.4 Visual condition of paved per RCAM Class (Page 48)
4.7 Unpaved Roads	4.3.5 The visual condition of the unpaved road network (Page 51)
4.8 Bridges	4.3.9 Visual condition indices of Road Structures (Page 55)
4.9 Comparative Condition of Assets	4.5 Comparative conditions (Page 78)
4.10 Asset Valuation	4.7 Asset valuation (Page 81)
4.11 Remaining Useful Life (RUL)	4.8 Remaining useful lives of assets (Page 82)
4.12 Trend Analysis	4.9 Trend analysis (Page 87)
4.13 Performance Gap Analysis	4.10 Performance gap analysis (Page 94)
4.14 Road Safety Assessment	4.14 Road Safety Assessments (Pages 96)
5. NEEDS DETERMINATION	5 Needs Determination (Pages 99 - 159)
5.1 Demand Forecast/Anticipating Community Needs	
5.2 Demand Management Plan	
5.3 Need Determination for the Current Road Network	

Appendix P – Road Network Information

2019 MANAGED ROAD NETWORK LENGTH	
Pavement type	**Length of Road Network**
Flexible	7 062.97
Unpaved	10 350.62
Concrete	50.62

	Flexible	Unpaved
Strategic Road Network (KPI)	3 236,66	0.00

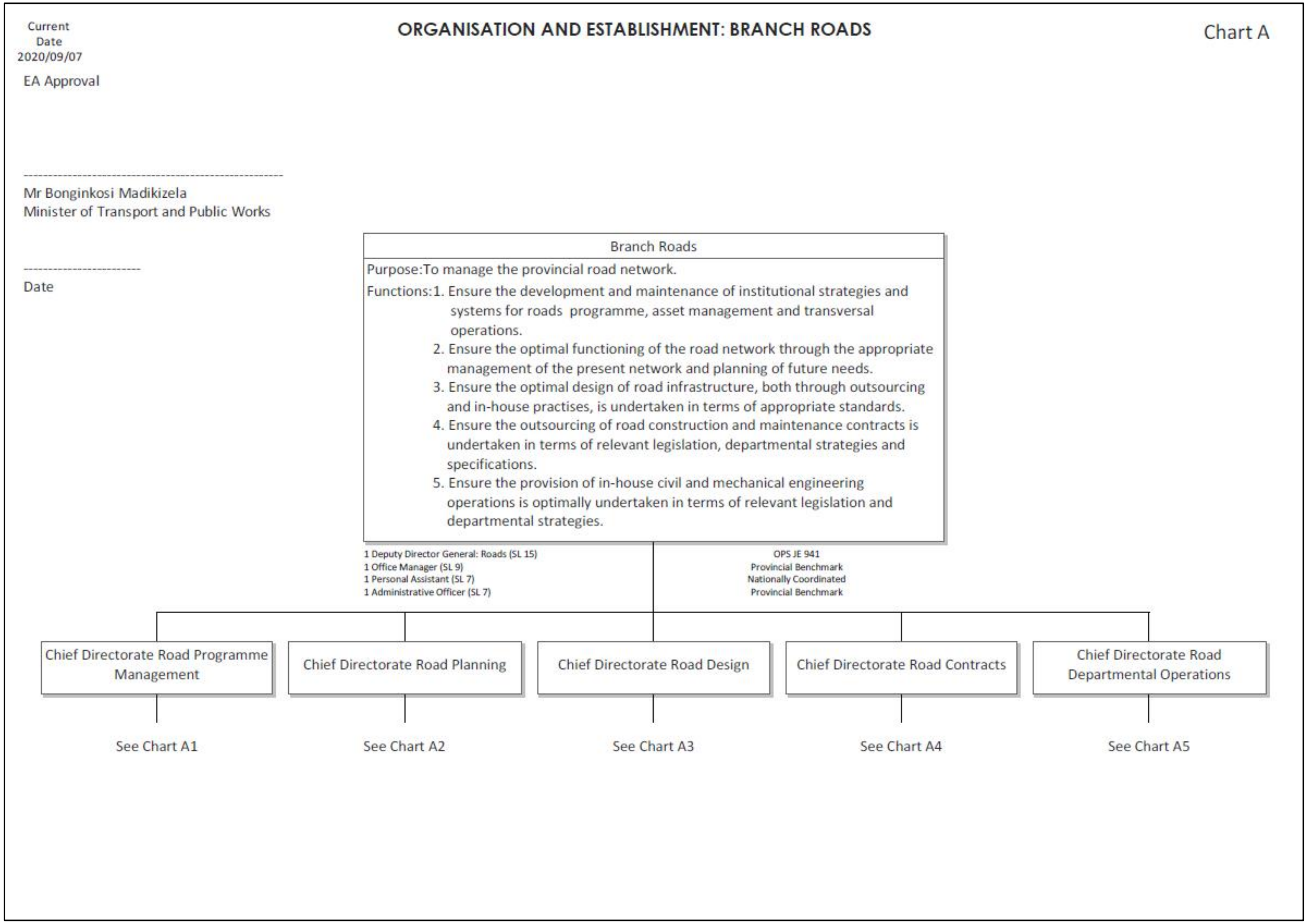
2019 Total PROCLAIMED Road Network Per Municipal District/Region		
District Name	**Flexible**	**Unpaved**
Cape Winelands	1 760.78	2 887.40
Central Karoo	633.42	6 143.13
Garden Route (Eden)	1 548.75	5 317.38
Overberg	990.73	2 732.05
West Coast	1 707.67	7 841.31
City of Cape Town (DMC)	278.81	14.53
UniCity	361.16	0.00
Total	**7 281.32**	**24 935.80**

	Bridges	Major Culverts
Structures (collect to date, 2020)	877	1800

The bridge and structure figures are still undergoing Quality Assurance, and to be updated in the next RAMP Submission.

2019 MANAGED Road Network - Road Classification			
Road Class	**Flexible**	**Unpaved**	**Total**
R1	235.78	0.00	235.78
R2	2 778.56	131.24	2 909.80
R3	2 755.94	1 741.11	4 497.05
R4	1 203.21	8 119.00	9 322.21
R5	89.48	359.27	448.75
Total	**7 062.97**	**10 350.62**	**17 413.59**

Appendix Q – Organisational Structure



Current Date 2020/09/07

ORGANISATION AND ESTABLISHMENT: CHIEF DIRECTORATE ROAD PROGRAMME MANAGEMENT

Chart A1

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Chief Directorate Road Programme Management

Purpose: To ensure the development and maintenance of institutional strategies and systems for roads programme, asset management and transversal operations.

Functions:
1. Develop and align the MTEF Road Implementation Programme.
2. Manage the programme and coordinate project management aspects of the approved programme.
3. Coordinate and facilitate all road operations and reporting.
4. Coordinate and facilitate the development of frameworks, policies and technical standards for the sustainability of the Road Branch.
5. Analyse, prepare and update asset management strategies, policies and plans and evaluate road network cost / performance.
6. Manage all road systems.

1 Chief Director (SL 14)
1 Personal Assistant (SL 7)
1 Specialist Engineer (OSD)

OPS JE 942
Nationally Coordinated
OSD

Subdirectorate Road Programme Development

Purpose: To develop and align the MTEF Road Implementation Programme.

Functions:
1. Develop and maintain the Road Infrastructure Preservation Strategy.
2. Identify and optimise preservation program of projects for each of the physical assets using life cycle cost analysis.
3. Packaging of prioritised elements into projects.
4. Managing road network life cycle optimisation.
5. Scheduling of projects into implementation plans that meet the desired program outcomes.
6. Ensure compliance with mandatory programme reporting requirements.

1 Chief Engineer (OSD)
2 Engineer Production (OSD)

Subdirectorate Road Programme Coordination

See Chart A1.1

Directorate Road Programme Services

See Chart A1.2

Subdirectorate Road Business Governance

Purpose: To coordinate and facilitate the development of frameworks, policies and technical standards for the sustainability of the Road Branch.

Functions:
1. Manage and coordinate the development, updating and dissemination of all technical standards and procedures in cooperation with other role-players.
2. Evaluate the Branch's technical and professional resources in terms of its sustainablility.
3. Manage and coordinate the development of a Quality Management system fo the Branch (ISO 9001, PMBOK) including the management of the Project Procedures Manual.
4. Research new and existing technologies that can be used in the Branch.
5. Manage and coordinate the development and maintenance of business processes.
6. Research different delivery and selection methods and develop a Delivery Partnering Framework.

1 Chief Engineer (OSD)
2 Engineer Production (OSD)

Subdirectorate Road Asset Management

Purpose: To analyse, prepare and update asset management strategies, policies and plans and evaluate road network cost / performance.

Functions:
1. Develop and maintain the Road System Management Strategy.
2. Develop strategic road asset management plans.
3. Prepare and update the Provincial Road Asset Management Plan.
4. Provide input regarding Programme Implementation and Integrated Transport Plans.
5. Provide strategic inputs into the Provincial Strategic Infrastructure plan from a road perspective.
6. Evaluate the network cost / performance.
7. Develop the Road Asset Management Policy (as defined in draft TMH22).
8. Develop and maintain a Road Infrastructure Safety Strategy.

1 Chief Engineer (OSD)
1 Engineer Production (OSD)

Subdirectorate Road Systems

See Chart A1.3

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: SUBDIRECTORATE ROAD PROGRAMME COORDINATION

Chart
A1.1

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate Road Programme Coordination
Purpose: To manage the programme and coordinate project management aspects of the approved programme.
Functions: 1. Compile a Project Initiation Report outlining the high-level business case together with the estimated project cost and proposed schedule for a single project or a group of projects. 2. Draft a multi-year infrastructure plan and budget. 3. Draft an Infrastructure Programme Management Plan for MTEF which includes delivery management and procurement strategy and plan. 4. Coordinate the processes with regard to the preparation and briefing, preliminary design for roads, detail design and production information. 5. Manage consultants in terms of contracts in the Planning and Design stage. 6. Perform overall quality assurance on all information captured on the IRM and Departmental Project Management System. 7. Identify and facilitate timeous actions by other stakeholders. 8. Manage the Project Office.

1 Chief Engineer (OSD)	OSD
1 Administrative Officer (SL7)	Provincial Benchmark
4 Engineer Production (OSD)	OSD
3 Control Engineering Technologist (OSD)	OSD
1 Project Office Manager (SL9)	2013
3 Project Administrator (SL8)	2013
3 Data and Information Administrator (SL7)	2013

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: DIRECTORATE ROAD PROGRAMME SERVICES

Chart
A1.2

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Directorate Road Programme Services

Purpose: To coordinate and facilitate all road operations and reporting.

Functions:
1. Ensure the processing of environmental authorisation applications for development and utilisation in terms of the National Environmental Management Act (NEMA).
2. Coordinate and facilitate all aspects of HR, Finance, SCM, Reporting and Professional Development for the Branch Roads.

1 Director
1 Personal Assistant

OPS JE 944
Nationally Coordinated

Division Environmental Compliance

Purpose: To ensure the processing of environmental authorisation applications for development and utilisation in terms of the National Environmental Management Act (NEMA).

Functions:
1. Administer (process), implement and make decisions (assess and adjudicate) on development applications that require authorisation in terms of NEM, EIA regulations and NEMA.
2. Audit compliance with environmental authorisations issued in terms of the NEM, EIA regulations and NEMA.
3. Provide advice, support and comment where necessary to other stakeholders with regard to environment impact management.
4. Develop and implement various environmental impact management tools (policy, norms and standards, environmental frameworks, guideline documents, etc) for Roads in conjuction with DEADP.

1 Control Environmental Officer (OSD)
4 Specialised Environmental Officer (OSD)

Subdirectorate Reporting, Coordination & Professional Development

Purpose: To coordinate and facilitate all aspects of HR, Finance, SCM, Reporting and Professional Development for the Branch Roads.

Functions:
1. Coordinate and facilitate all aspects of HR, Finance, Logistics and reporting (internal and external) for the branch.
2. Coordinate and facilitate all aspects regarding candidate programme and professional development in the Branch.

1 Deputy Director Admin & Professional Develop (SL11)

Division Administration and Reporting

Purpose: To coordinate and facilitate all aspects of HR, Finance, SCM and reporting (internal and external) for the Branch.

Functions:
1. Coordinate generic administrative functions (HR, Fin, Logistics) and liaise with relevant Head Office component (e.g. CRU, Finance, etc.).
2. Provide a comprehensive secretariat and line administrative service, inclusive of internal and external reporting for the Branch.

1 x Assistant Director (SL 9) — OPS JE 1297
2 x Administrator Branch Coord (SL7) — OPS JE 1296
2 x Administrator Secret & Line Supp (SL7)
1 x Administration Clerk (SL 5)

Division Candidate Programme and Professional Development

Purpose: To coordinate and facilitate all aspects regarding candidate programme and professional development

Functions:
1. Coordinate and facilitate all administrative aspects of professional development for the roads engineering professionals (engineers, technicians, technologists).
2. Coordinate and facilitate all administrative aspects of the roads candidate programme.
3. Train artisans.

1 x Assistant Director (SL 9) — OPS JE 1295
1 x Administrator Profe Dev Roads (SL7) — OPS JE 1298
1 x Technical Training Officer (SL8)
3 x Administration Clerk (SL 5)

Current
Date
2020/09/07

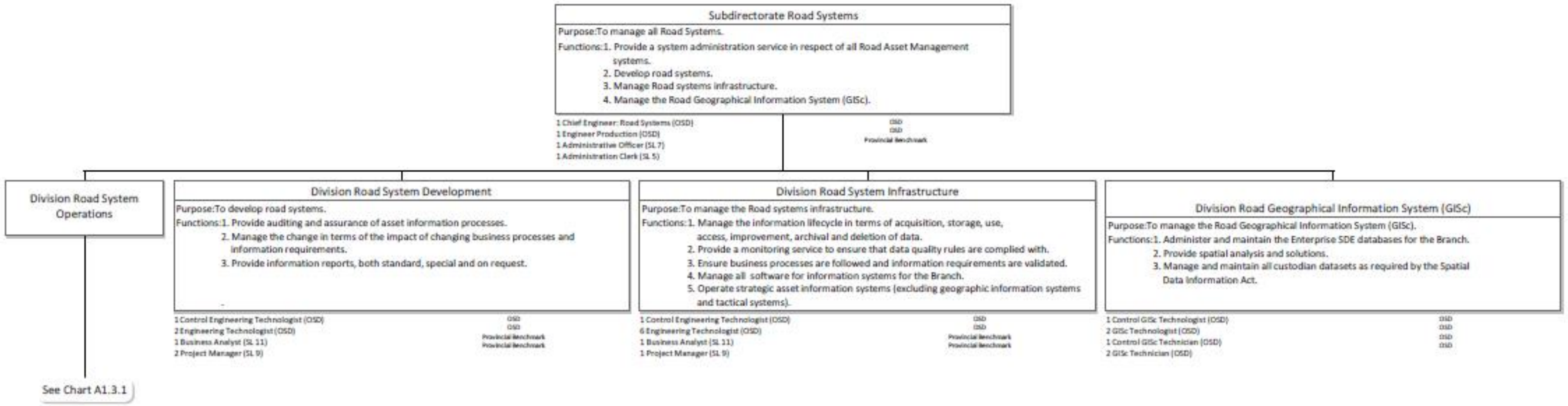
ORGANISATION AND ESTABLISHMENT: SUBDIRECTORATE ROAD SYSTEMS

Chart
A1.3

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date



Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: SUBDIRECTORATE ROAD SYSTEMS

Chart
A1.3.1

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Division Road System Operations

Purpose:To provide a system administration service in respect of all Road Asset Management Systems.

Functions:
1. Enhance and manage road asset information systems.
2. Implement condition assessments.
3. Provide data collection services.
4. Manage and operate the non-spatial systems of the Branch.
5. Provide technical information when required and manage data in terms of systems

1 Control Engineering Technologist (OSD)	OSD

Road Network (RNIS)

1 Control Engineering Technician (OSD)	OSD
2 Engineering Technician Production (OSD)	OSD

Traffic (TCS,PAS/Accident Data Centre)

1 Engineering Technologist (OSD)	OSD
2 Engineering Technician Production (OSD)	OSD
5 Data Verifier (SL5)	OPS JE 1267
5 Data Capturer (SL4)	OPS JE 1268

Paved (PMS,VisMUN,HDM4,VOC, DSC)

2 Control Engineering Technician (OSD)	OSD
1 Engineering Technologist (OSD)	OSD
6 Engineering Technician Production (OSD)	OSD

Un - Paved (GRMS, MIMS)

1 Control Engineering Technician (OSD)	OSD
1 Engineering Technologist (OSD)	OSD
2 Engineering Technician Production (OSD)	OSD

Structures (BMS)

1 Control Engineering Technician (OSD)	OSD
1 Engineering Technician Production (OSD)	OSD

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: CHIEF DIRECTORATE ROAD PLANNING

Chart A2

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Chief Directorate Road Planning

Purpose:To ensure the optimal functioning of the road network throught the approriate management of the present network and planning of future needs.

Functions:
1. Manage the planning of the declared road network in terms of new infrastructure identification needs assessment and economic evaluation.
2. Manage the operational use of the declared road network in terms of mobility, access, compliance with legislative doctrines and usage of road reserves.
3. Manage all processes regarding the proclamation of provincial roads, expropriation of land and technical cooperation with other spheres of government.

1 Chief Director
1 Personal Assistant
1 Specialist Engineer (OSD)

OPS JE 946
Nationally coordinated
OSD

Subdirectorate Road Investment Planning

Purpose:To manage the planning of the declared road network in terms of new infrastructure identification needs assessment and economic evaluation.

Functions:
1. Identify new infrastructre projects to address gaps in the road network in response to future demand and in support of growth and development.
2. Develop and maintain the Road Investment (New Infrastructure) Strategy.
3. Identify and optimise investment programme for each of the New Roads using the cycle cost analysis.
4. Identify and develop Corridor Management Strategies using transport models.

1 Chief Engineer (OSD)
3 Engineer Production (OSD)

Subdirectorate Road Use Management

Purpose:To manage the operational use of the declared road network in terms of mobility, access, compliance with legislative doctrines and usage of road reserves.

Functions:
1. Develop and maintain road use management strategies.
2. Manage the impact of spatial planning on declared roads - manage infrastructural requirements in terms of the Western Cape Transport Infrastructure Act.
3. Control access to roads declared in terms of the Western Cape Transport Infrastrucutre Act.
4. Manage usage of the road reserve through judicious approval of way-leaves.
5. Evaluate proposals affecting the road network.
6. Manage legal compliance with the provisions of the Western Cape Transport Infrastructure Act.

1 Chief Engineer (OSD)
2 Engineer Production (OSD)

OSD

Directorate Road Planning Services

See Chart A2.1

Current Date 2020/09/07

ORGANISATION AND ESTABLISHMENT: DIRECTORATE ROAD PLANNING SERVICES

Chart A2.1

EA Approval

____

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

____

Date

Directorate Road Planning Services

Purpose: To manage all processes regarding the proclamation of provincial roads, expropriation of land and technical cooperation with other spheres of government.

Functions:
1. Manage processes for the acquisition / expropriation, transfer and alienation of land.
2. Manage processes for the proclamation of provincial roads and technical services for road use.
3. Ensure technical cooperation between different spheres of government.

1 Director (SL13)	OPS JE 947
1 Personal Assistant (SL7)	Nationally coordinated

Subdirectorate Road Ownership and Expropriation

Purpose: To manage processes for the acquisition / expropriation, transfer and alienation of land.

Functions:
1. Manage the permanent and temporary acquisition/appropriation of immovable assets required for road purposes.
2. Manage the process to survey and transfer immovable road assets into the name of the Roads Trustees in terms of the Roads Ordinance 19 of 1976.
3. Manage and maintain asset register of all land acquired/expropriated for road purposes.
4. Manage and consider applications by local authorities to acquire/expropriate land for road purposes with the aid of subsidy from department.
5. Manage the process to consider applications to alienate superfluous road reserve land.
6. Manage and consider applications by local authorities to alienate superfluous road reserve land acquired with the aid of subsidy.
7. Manage the transfer of land to other road authorities.
8. Manage proposals/applications affecting the provincial proclaimed road network.

1 Deputy Director (SL 11)	OPS JE 1269
1 ASD Road Assets & Ownership (SL 9)	OPS JE 1270
1 ASD Acquisition & Transfer (SL 9)	OPS JE 1271
3 Admin Officer: Ownership Enquiries and Mun Acc (SL 7)	OPS JE 1276
3 Admin Officer: Acquisitions & Exprop (SL 7)	OPS JE 1277
3 Admin Officer: Asset Man & Alienation (SL 7)	OPS JE 1278
3 Admin Officer: Survey & Transfers (SL 7)	OPS JE 1280

Subdirectorate Proclamation and Road Use

Purpose: To manage processes for the proclamation of provincial roads and technical services for road use.

Functions:
1. Coordinate and administer all technical input of proposed land use changes and their impact on the proclaimed road network.
2. Manage the processes for the proclamation, de-proclamation, closing, diversion and alteration of the classification of proclaimed provincial roads.
3. Manage and maintain all Provincial Road Network related proclamations and Road Location Plans.

1 Control Engineering Technologist (OSD)	OSD
1 Engineering Technologist (OSD)	OSD
2 Control Engineering Technician (OSD)	OSD
3 Engineering Technician (OSD)	OSD
1 ASD Proclamations and Road Use (SL 9)	OPS JE 1272
1 Administrative Officer (SL 8)	2013
3 Administrative Officer Proclamations (SL 7)	OPS JE 1279
3 Technical Assistant (SL 6)	2013
1 Administration Clerk (SL 5))	

Subdirectorate Intergovernmental Coordination

Purpose: To ensure technical cooperation between different spheres of government.

Functions:
1. Manage all road infrastructure components of Provincial and Departmental Plans within the joint planning environments.
2. Coordinate the inputs for identifying Regional level projects in terms of roads infrastructure (new & preservation).
3. Manage and engage in terms of related infrastructure planning, agreements and subsidy arrangements for all spheres of government, provided for Legislation (excluding departmental, agency functions for C municipalities).
4. Participate in, and comment on, regional road and transport integrated infrastructure planning processes and requirements across municipal borders.

1 Control Engineering Technologist (OSD)
1 Engineering Technologist (OSD)
2 Engineering Technician Production (OSD)
1 Administrative Officer (SL 7)

Current
Date
2020/09/07

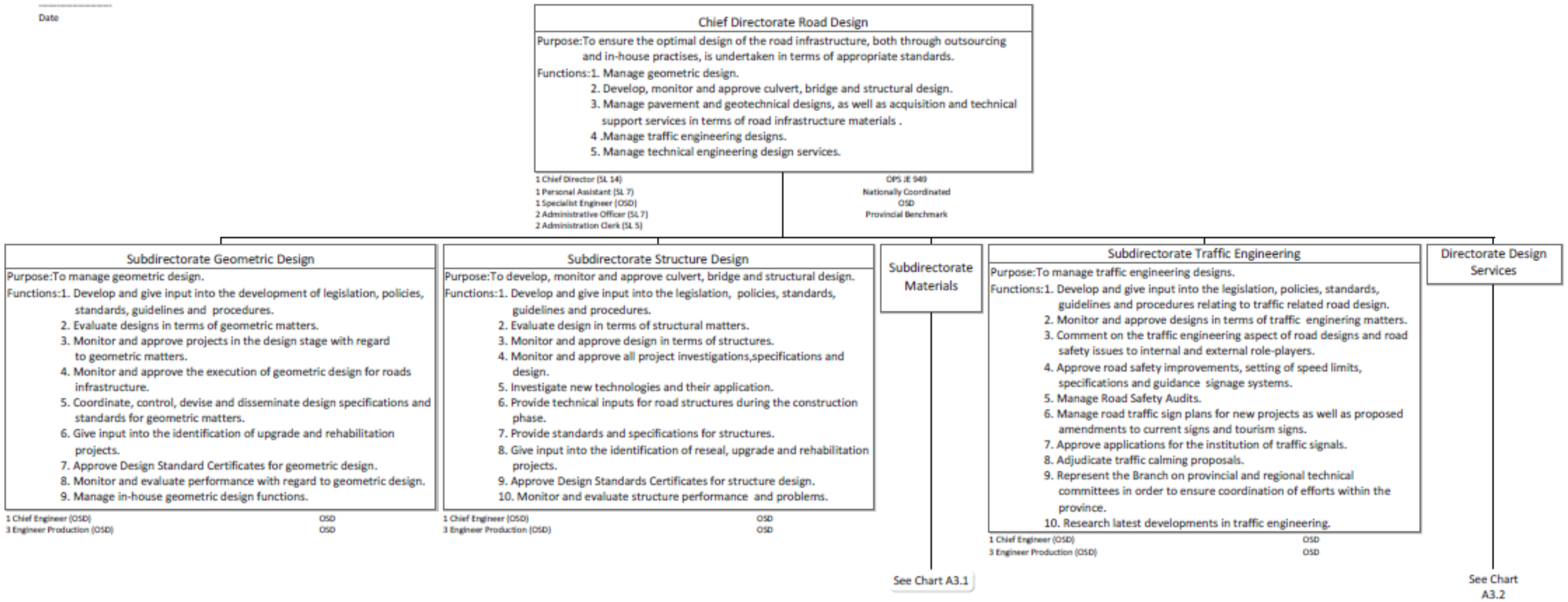
ORGANISATION AND ESTABLISHMENT: CHIEF DIRECTORATE ROAD DESIGN

Chart A3

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date



Current Date 2020/09/07

ORGANISATION AND ESTABLISHMENT: SUBDIRECTORATE MATERIALS

Chart A3.1

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate Materials

Purpose: To manage pavement and geotechnical designs, as well as acquisition and technical support services in terms of road infrastructure materials.

Functions:
1. Manage pavement and geotechnical designs.
2. Manage the acquisition of road infrastructure materials and research pertaining to new products, specifications and test methods.
3. Provide a technical support service in respect of quality control and management of road and bridge construction materials.

1 Chief Engineer (OSD)	OSD
4 Engineer Production (OSD)	OSD
2 Administrative Officer (SL 7)	OPS JE 17118
1 Administration Clerk (SL 5)	OPS JE 17242

Division Materials Sourcing

Purpose: To manage the acquisition of road infrastrucutre materials and research pertaining to new products, specifications and test methods.

Functions:
1. Research, develop, evaluate and investigate new products, standard test methods and specification requirements.
2. Manage the sourcing of strategic road and bridge material.
3. Perform internal audits.

1 Control Engineering Technologist (OSD)
3 Engineering Technologist (OSD)
1 Control Engineering Technician (OSD)
2 Engineering Technician Production (OSD)

Division Materials Laboratory

Purpose: To provide a technical support service in respect of quality control and management of road and bridge construction materials.

Functions:
1. Monitor, maintain and ensure the quality control of all road and bridge construction materials.
2. Render advice, training and guidance in the provision of information regarding material related matters, as built data and standard specifications.
3. Manage and operate all laboratory software management systems.
4. Provide technical support in the design of road pavements.
5. Approve all mix designs for road pavement and concrete structures.
6. Manage and operate the Laboratory Quality Systems (Accreditation).
7. Serve on National Technical Committees in the provision of technical support and information on National Standards and Specifications, Standard Test Methods and Laboratory Proficiency Schemes.
8. Research and investigate new products, standard test methods and specification requirements.

1 Control Engineering Technologist (OSD)	OSD
2 Control Engineering Technician (OSD)	OSD
1 Engineering Technologist (OSD)	OSD
5 Engineering Technician Production (OSD)	OSD
17 Geo Technical Assistant (SL5)	OPS JE 1265
9 Laboratory Assistant (SL3)	OPS JE 1266

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: DIRECTORATE DESIGN SERVICES

Chart A3.2

EA Approval

____
Mr Bonginkosi Madikizela
Minister of Transport and Public Works

____
Date

Directorate Design Services

Purpose: To manage technical engineering design services.

Functions:
1. Provide technical traffic engineering support and manage the design and implementation of Road Traffic Signs (Directional, Guidance and Tourism).
2. Provide technical traffic engineering support in order to optimise the road network with regard to operational parameters such as safety, capacity and traffic flow.
3. Provide technical traffic engineering and management support with regard to the management of abnormal loads and overload control weighbridges.
4. Provide engineering and management support with regard to geometrics and structures.
5. Provide survey, cadastral and expropriation plans, related data and information, for the maintenance and improvement of the Western Cape Provincial Road Network.

1 Director (SL13)
1 Personal Assistant (SL7)
1 Administrative Officer (SL 7)
1 Admin Clerk (Technical) (SL 5)

OPS JE 950
Nationally Coordinated
Provincial Benchmark

Subdirectorate Traffic Signs

Purpose: To provide technical traffic engineering support and manage the design and implementation of Road Traffic Signs (Directional, Guidance and Tourism).

Functions:
1. Design signs using Traffsoft.
2. Represent the Roads Branch at National Route Numbering and Road Traffic Signs Committes and Regional Tourism Sign Liaison Committes meetings.
3. Conduct site investigations.
4. Liaise with manufacturers of signs.
5. Communicate with regional offices and field officers ensuring signs are installed in the correct position.
6. Liaise with planning directorate.
7. Review applications and determine if signs are warranted.

1 Control Engineering Technologist (OSD)	OSD
1 Engineering Technologist (OSD)	OSD
1 Control Engineering Technician (OSD)	OSD
3 Engineering Technician Production (OSD)	OSD

Subdirectorate Traffic Engineering Support and Safety

Purpose: To provide technical traffic engineering support in order to optimise the road network with regard to operational parameters such as safety, capacity and traffic flow.

Functions:
1. Manage output of the Accident Data Centre.
2. Conduct road safety inspections, road accident inspections, road audits and report thereon.
3. Identify high frequency traffic locations.
4. Retrieve and analyse accident data.
5. Manage traffic signal designs and setting of speed limits on provincial roads.
6. Evaluate intersection control methods (4 way stop, traffic signals, roundabouts) and provide recommendations.
7. Plan, design, implement and make recommendations on traffic calming devices.

1 Control Engineering Technologist (OSD)	OSD
2 Engineering Technologist (OSD)	OSD
1 Control Engineering Technician (OSD)	OSD
2 Engineering Technician Production (OSD	OSD

Subdirectorate Abnormal Loads and Weighbridges

Purpose: To provide technical traffic engineering and management support with regard to the management of abnormal loads and overload control weighbridges.

Functions:
1. Register vehicles used to carry abnormal loads in order to establish limits that may be allowed per permit.
2. Technically evaluate applications for abnormal load exemption permits.
3. Maintain the Abnormal Loads Vehicle Registation and Permit Issuing System in liaison with engineering and technical personnel from road authorities, traffic law enforcement personnel, transport consultants and abnormal loads haulers.
4. Monitor effectiveness of law enforcement by evauating monthly reports, establishing trends and making recommendations for improvements.
5. Liaise with Department of Community Safety in terms of the service level agreement.
6. Develop operational plans and weighbridge operation and reporting systems.
7. Manage planning and design phases of all weighbridges in the province.
8. Draft policies and implementation strategies and partake in long term strategic planning.

1 Control Engineering Technologist (OSD)	OSD
1 Engineering Technologist (OSD)	OSD
1 Control Engineering Technician (OSD)	OSD
2 Engineering Technician Production (OSD)	OSD

Subdirectorate Design Support Services

Purpose: To provide engineering and management support with regard to geometrics and structures.

Functions:
1. Provide engineering and management support with regard to geometrics.
2. Provide engineering and management support with regard to structures.

1 Control Engineering Technologist (OSD)	OSD
2 Engineering Technologist (OSD)	OSD
2 Control Engineering Technician (OSD)	OSD
4 Engineering Technician Production (OS)	OSD
1 Technical Assistant (SL 5)	OPS JE 1288

Subdirectorate Survey and Mapping

Purpose: To provide survey, cadastral and expropriation plans, related data and information, for the maintenance and improvement of the Western Cape Provincial Road Network.

Functions:
1. Provide field survey service for areas of investigation, road design and the staking and setting out of construction projects.
2. Compile and provide survey plans for information and planning purposes.
3. Quality control survey plans and data to ensure compliance with prescribed TMH11 standards (outsourced and in-house).
4. Provide sketches and extracts and survey information for expropriation purposes.
5. Quality control of expropriation sketches and data to ensure compliance with prescribed standards (outsourced and in-house).
6. Provide information and techncial expertise regarding survey and expropriation to the private public sectors.
7. Compile cadastral data in digital format for mapping and expropriation.
8. Quality control of cadastral compilation and calculation to ensure compliance with prescribed standards (outsources and in-house).
9. Manage survey quotes submitted by private sector.
10. Manage the maintenance of survey and expropriation records, Survey Equipment Store and Survey data in Plan Room.

1 Land Surveyor (OSD)	OSD
1 Control Survey Technician (OSD)	OSD
6 Survey Technician (OSD)	OSD

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: CHIEF DIRECTORATE ROAD CONTRACTS

Chart A4

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Chief Directorate Road Contracts

Purpose: To ensure the outsourcing of road construction and maintenance contracts is undertaken in terms of relevant legislation, departmental strategies and specifications.

Functions:
1. Manage capital construction and capital maintenance contracts in Region 1.
2. Manage capital construction and capital maintenance contracts in Region 2.
3. Implement and manage routine road maintenance and weighbridge contracts.
4. Coordinate strategic, technical and administrative aspects of construction and maintenance contracts.
5. Provide operational and administrative support in terms of contract management.

1 Chief Director (SL 14)	OPS JE 953
1 Personal Assistant (SL 7)	Nationally Coordinated
1 Specialist Engineer (OSD)	OSD

Subdirectorate Construction & Maintenance Contracts (Region 1)

Purpose: To manage capital construction and capital maintenance contracts in Region 1.

Functions:
1. Manage contractual input in tender and contract documentation.
2. Manage technical input in appointment of contractors.
3. Manage construction and capital maintenance projects.
4. Report on construction and capital maintenance contracts.

1 Chief Engineer (OSD)	OSD
3 Engineer Production (OSD)	OSD

Directorate Road Contract Services

Purpose: To implement and manage routine road maintenance and weighbridge contracts.

Functions:
1. Manage contractual input in tender and contract documentation.
2. Manage technical input in appointments of contractors.
3. Manage routine road maintenance.
4. Manage weighbridge operation contracts.
5. Report on Non-Capital contracts.

1 Director (SL13)	OPS JE
1 Personal Assistant	Nationally Coordinated
2 Control Engineering Technologist (OSD)	OSD
2 Engineering Technologist (OSD)	OSD
6 Engineering Technician (OSD)	OSD

Subdirectorate Construction & Maintenance Contracts (Region 2)

Purpose: To manage capital construction and capital maintenance contracts in Region 2.

Functions:
1. Manage contractual input in tender and contract documentation.
2. Manage technical input in appointment of contractors.
3. Manage construction and capital maintenance projects.
4. Report on construction and capital maintenance contracts.

1 Chief Engineer (OSD)	OSD
3 Engineer Production (OSD)	OSD

Subdirectorate Road Contract Facilitation and Development

Purpose: To coordinate strategic, technical and administrative aspects of construction and maintenance contracts.

Functions:
1. Develop and manage the strategic implementation of the contracts.
2. Coordinate pro-forma contract documentation.
3. Perform statistical analysis of contractual data.
4. Liaise nationally and provincially on contract documentation issues.

1 Chief Engineer (OSD)	OSD
1 Engineer Production (OSD)	OSD

Division Operational Support

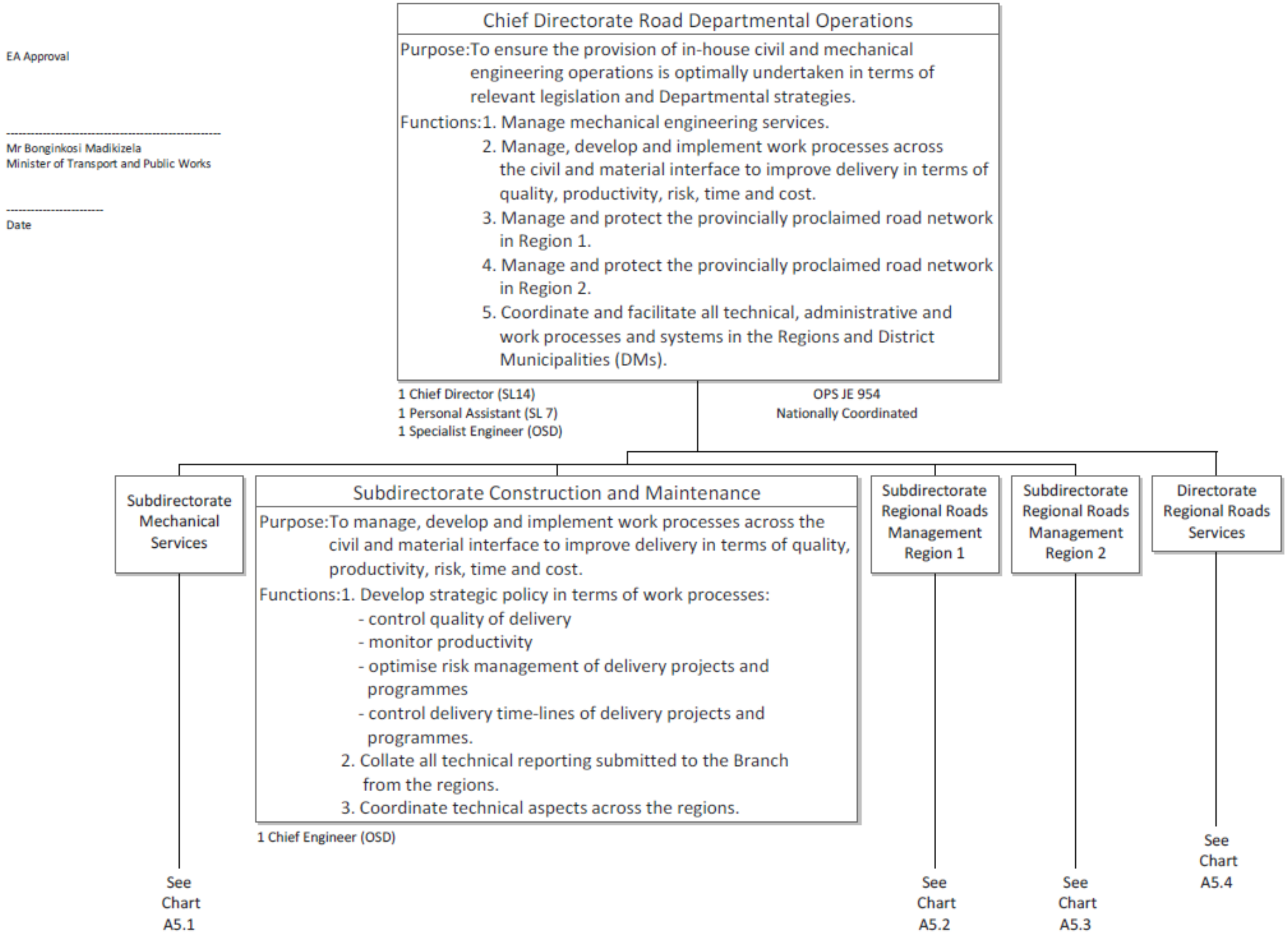
Purpose: To provide operational support in terms of contract management

Functions:
1. Manage all payments to consulting engineers, contractors and other private sector entitities (e.g. Eskom, Telkom) as well as transfer payments to local municipalities.
2. Monitor cash-flow to and actual expenditure of municipal capital projects and contributions from local authorities and other entities towards capital projects.
3. Ensure completeness and quality of contractor guarantees, consultant fee claims and payment certificates of contractors.
4. Provide the support during the tender process by preparing advertisement, tender documentation, award letters and safeguarding all tender submissions during the tender evaluation and bid adjudication process.

1 Assistant Director (SL 9)	OPS JE 1291
2 Administrative Officer (SL 7)	OPS JE 1292
4 Administration Clerk (SL 5)	OPS JE 1293

ORGANISATION AND ESTABLISHMENT: CHIEF DIRECTORATE ROAD DEPARTMENTAL OPERATIONS

Chart A5



Current
Date
2020/09/07

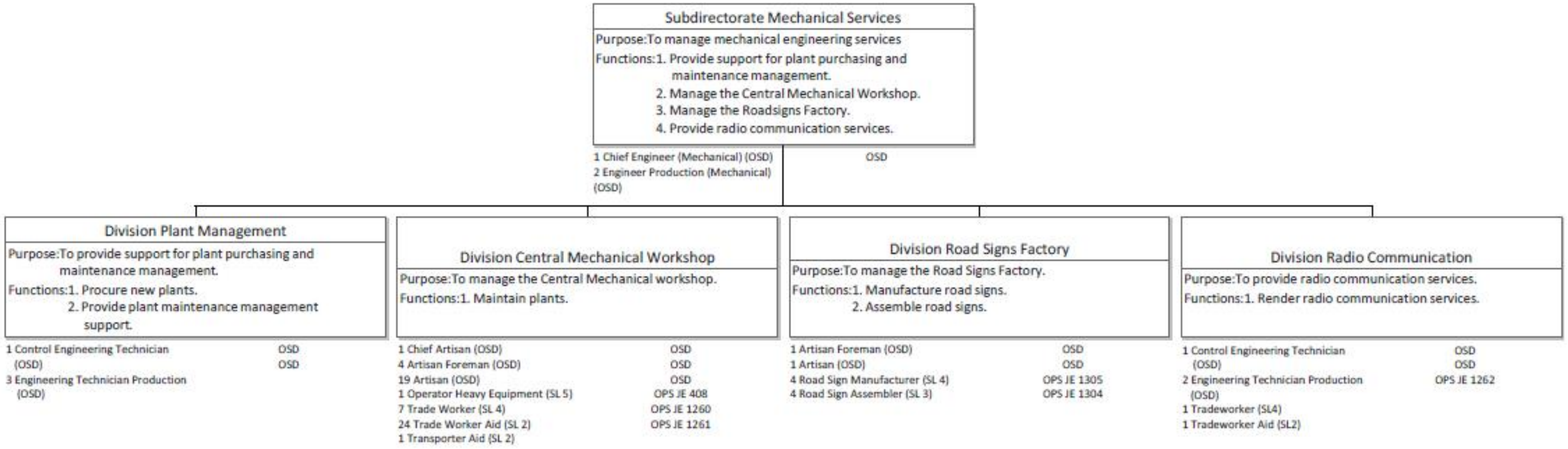
ORGANISATION AND ESTABLISHMENT: SUBDIRECTORATE MECHANICAL SERVICES

Chart A5.1

EA Approval

....
Mr Bonginkosi Madikizela
Minister of Transport and Public Works

....
Date



Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: REGIONAL ROADS MANAGEMENT REGION 1

Chart A5.2

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate Regional Road Management (Region 1)

Purpose:To manage and protect the provincially proclaimed road network in Region 1.

Functions:1. Render road maintenance services.
2. Render construction and specialised road maintenance services.

1 Chief Engineer (OSD)
2 Engineer Production (OSD)
1 Control Engineering Technologist (OSD)
1 Admin Officer (SL 7)
1 Admin Clerk (SL 5)

Division Routine Maintenance

Purpose:To render road maintenance services.

Functions:1. Perform blading of gravel roads.
2. Perform spot regravel.
3. Perform routine maintenance.
4. Perform draining and structure repairs.
5. Perform surface patching on roads.

1 Engineering Technologist(OSD)	OSD
4 Regional Foreman (SL 7)	OPS JE 324
7 Area Foreman(SL 6)	OPS JE 325
25 Road Worker Supervisor(SL 4)	OPS JE 406
250 Road Worker(SL 2)	OPS JE 326
	OPS JE 327

Division Construction and Specialised Maintenance

Purpose:To render construction and specialised road maintenance services.

Functions:1. Reseal and regravel roads in the region.
2. Upgrade, rehabilitate and reconstruct roads in the region.
3. Perform drainage and structure reconstruction.
4. Manage the District Municipality acting as agents for road construction in the region.
5. Repair roads during flood disasters.
6. Perform road marking.
7. Maintain road camps and rest places.

1 Engineering Technologist(OSD)
1 Regional Foreman (SL 7)
2 Operator: Heavy Equipment (SL 5)
3 Specialised Operator Grader (SL 5)
21 Operator (SL4)
13 Road Worker Supervisor (SL 4)
2 Transporter Aid (SL 2)
62 Road Worker (SL2)
14 Road Marker

Current
Date
2020/09/07

ORGANISATION ABD ESTABLISHMENT: REGIONAL ROADS MANAGEMENT REGION 2

Chart A5.3

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate Regional Roads Management (Region 2)

Purpose:To manage and protect the provincially proclaimed road network in Region 2.

Functions:1. Render road maintenance services.
2. Render construction and specialised road maintenance services.

1 Chief Engineer (OSD) — OSD
2 Engineer Production (OSD) — OSD
1 Control Engineering Technologist (OSD)
1 Admin Officer (SL 7)
1 Admin Clerk (SL 5)

Division Routine Maintenance

Purpose:To render road maintenance services.

Functions:1. Perform blading of gravel roads.
2. Perform spot regravel.
3. Perform routine maintenance.
4. Perform draining and structure repairs.
5. Perform surface patching on roads.

1 Engineering Technologist (OSD)	OSD
4 Regional Foreman (SL 7)	OPS JE 324
3 Area Foreman (SL 6)	OPS JE 325
19 Road Worker Supervisor (SL 4)	JE OPS 326
190 Road Worker (SL 2)	JE OPS 327

Division Construction and Specialised Maintenance

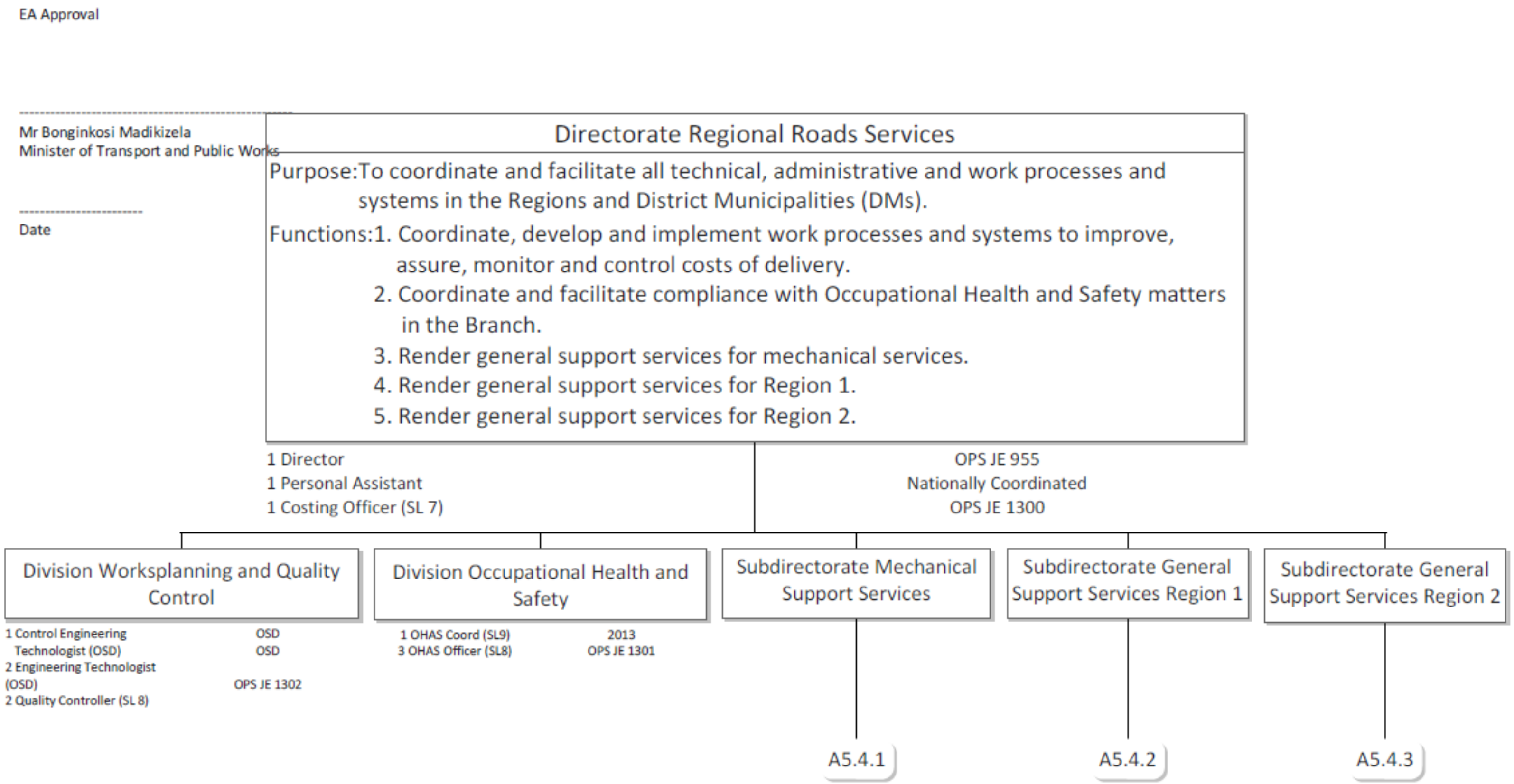
Purpose:To render construction and specialised road maintenance services.

Functions:1. Reseal and regravel roads in the region.
2. Upgrade, rehabilitate and reconstruct roads in the region.
3. Perform drainage and structure reconstruction.
4. Manage the District Municipality acting as agents for road construction in the region.
5. Repair roads during flood disasters.
6. Perform road marking.
7. Maintain road camps and rest places.

1 Engineering Technologist(OSD)
1 Regional Foreman
1 Area Foreman(SL6)
1 Operator: Heavy Equipment (SL 5)
2 Specialised Operator Grader (SL 5)
8 Operator (SL4)
3 Operator Roadmarker (SL 4)
1 Transporter Aid (SL 2)
3 Road Worker Supervisor (SL 4)
6 Road Marker (SL 2)
12 Road Worker (SL2)
1 Camp Maintenance Supervisor (SL 4)
6 Camp Maintenance Worker (SL 2)

ORGANISATION AND ESTABLISHMENT: CHIEF DIRECTORATE ROAD DEPARTMENTAL OPERATIONS

Chart A5.4



Current Date 2020/09/07

ORGANISATION AND ESTABLISHMENT: MECHANICAL SUPPORT SERVICES

Chart A5.4.1

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate Mechanical Support Services

Purpose: To render general support services for Mechanical Services.

Functions:
1. Render a supply chain management and fleet administration service.
2. Render financial and management accounting service.
3. Render a human resource and general support service.

1 Deputy Director (SL 11) — OPS JE

Division SCM and Fleet Administration

Purpose: To render a supply chain management and fleet administration service.

Functions:
1. Render a supply chain management service.
2. Render a fleet administrative support service.

1 Assistant Director (SL 9)	OPS JE
1 SCM Officer (SL8)	OPS JE
1 Chief SCM Clerk (SL 7)	OPS JE
1 Admin Officer Fleet Admin (SL7)	
1 Admin Clerk Fleet Procure (SL5)	
3 Admin Clerk Fleet Maint (SL5)	
4 SCM Clerk (SL 5)	
1 Store Clerk	
2 Store Assistant (SL 2)	

Section Management and Financial Accounting

Purpose: To render financial and management accounting service.

Functions:
1. Render a financial accounting service.
2. Render a management accounting service.

1 State Accountant (SL8)	OPS JE 1306
1 Accounting Clerk (SL5)	
1 Accounting Clerk: Costing (SL5)	OPS JE 1281
1 Data Capturer (SL4)	

Section HR and General Support Services

Purpose: Render a human resource and general support service.

Functions:
1. Coordinate human resource matters.
2. Render general support services

1 Administrative Officer (SL 8)	OPS JE 1316
1 Admin Clerk: Workshop (SL 5)	OPS JE 1275
2 Administration Clerk (SL 5)	OPS JE 1311
1 Receptionist (SL 4)	OPS JE 1313
1 Driver/Messenger (SL 4)	Nationally Coordinated
1 Cleaner (SL 2)	Nationally Coordinated

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: REGIONAL ROADS SERVICES REGION 1

Chart A5.4.2

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate: General Support Services: Region 1

Purpose:To render general support services for Region 1.

Functions:1. Render a management and financial accounting service.
2. Render a supply chain management service.
3. Render a human resource and general office support service.

1 Deputy Director (SL 11)

Division: Management and Financial Accounting

Purpose:To render a management and financial accounting service.

Functions:1. Render a management accounting service.
2. Render a financial accounting service.

1 Assistant Director: Finance (SL 9)	OPS
1 State Accountant: Management	OPS
Accounting (SL 8)	OPS
1 State Accountant: Financial	
Accounting (SL 7)	
2 Accounting Clerk: Payments SL5)	
2 Accounting Clerk: Costing (SL 5)	
1 Data Capturer (SL 4)	

Division: Supply Chain Managment

Purpose:To render a supply management service.

Functions:1. Render an acquisition and contract management service.
2. Render a logistic and asset management service.

1 Assistant Director: SCM (SL 9)	OPS
1 SCM Officer (SL 8)	OPS
1 Chief SCM Clerk: (SL 7)	OPS
2 SCM Clerk: Movable Assets(SL5)	OPS
2 SCM Clerk: Posting (SL 5)	OPS
2 SCM Clerk: Orders (SL 5)	OPS
2 SCM Clerk: Transit (SL 5)	OPS
1 SCM Clerk: (SL5)	OPS JE 1254
1 SCM Clerk Fuel (SL5)	OPS JE 1282
1 Store Clerk (SL 5)	OPS JE 1255
4 Store Assistant (SL 2)	OPS
1 Store Assistant Fuel (SL2)	OPS
1 Truck Driver Fuel Supply (SL 4)	OPS JE 1256
1 Fuel Supply Assistant (SL2)	OPS JE 1257

Division: Human Resource and General Office Support

Purpose:To render a human resource and general office support service.

Functions:1. Coordinate human resource matters.
2. Render a project administration support service.
3. Render cleaning services.
4. Render general office administration services

1 Assistant Director (SL 9)	OPS
2 Chief Admin Clerk (SL7)	OPS JE 1314
1 Administration Clerk (SL 5)	OPS JE 1311
7 Administration Clerk (HR) (SL5)	OPS JE 1312
2 Admin Clerk: Workshop (SL 5)	OPS JE 1313
1 Receptionist (SL4)	OPS
1 Registry Clerk (SL 5)	OPS JE 1259
2 Office Assistant (SL2)	OPS
1 Driver / Messenger (SL4)	OPS
2 Cleaner (SL 2)	

Current
Date
2020/09/07

ORGANISATION AND ESTABLISHMENT: REGIONAL ROADS MANAGEMENT REGION 2

Chart A5.4.3

EA Approval

Mr Bonginkosi Madikizela
Minister of Transport and Public Works

Date

Subdirectorate: General Support Services: Region 2

Purpose: To render general support services for Region 2.

Functions:
1. Render a management and financial accounting service.
2. Render a supply chain management service.
3. Render a human resource and general office support service.

1 Deputy Director (SL 11)	OPS

Division: Management and Financial Accounting

Purpose: To render a management and financial accounting service.

Functions:
1. Render a management accounting service.
2. Render a financial accounting service.

1 Assistant Director: Finance (SL 9)	OPS
1 State Accountant: Management Accounting (SL 8)	OPS OPS JE 1281
1 State Accountant: Financial Accounting (SL 7)	
1 Accounting Clerk: Payments SL5)	
1 Accounting Clerk: Costing (SL 5)	
1 Data Capturer (SL 4)	

Division: Supply Chain Managment

Purpose: To render a supply management service.

Functions:
1. Render an acquisition and contract management service.
2. Render a logistic and asset management service.

1 Assistant Director: SCM (SL 9)	OPS
1 SCM Officer (SL 8)	OPS
1 Chief SCM Clerk: (SL 7)	OPS
1 SCM Clerk: Movable Assets(SL5)	OPS
1 SCM Clerk: Posting (SL 5)	OPS
1 SCM Clerk: Orders (SL 5)	OPS
1 SCM Clerk: Transit (SL 5)	OPS
1 SCM Clerk: (SL5)	OPS JE 1254
1 Store Clerk (SL5)	OPS JE 1282
1 Store Assistant (SL 2)	OPS JE 1255

Division: Human Resource and General Office Support

Purpose: To render a general human resource and general office support service.

Functions:
1. Coordinate human resource matters.
2. Render a project administration support service.
3. Render a cleaning services.
4. Render general office administration services

1 Assistant Director(SL 9)	OPS JE 1316
2 Chief Admin Clerk (SL7)	OPS JE 1314
1 Administration Clerk (SL 5)	OPS JE 1311
4 Administration Clerk (HR) (SL5)	OPS JE 1312
2 Admin Clerk: Workshop (SL 5)	OPS JE 1313
1 Receptionist (SL4)	OPS
1 Registry Clerk (SL 5)	OPS JE 1259
1 Driver / Messenger (SL4)	OPS
2 Cleaner (SL 2)	OPS

Appendix R – Corporate Branding

Background

The Corporate Identity Guidelines of the Western Cape Province were used for this report. The alternative Typeface prescribed by this document namely; Century Gothic are used in either black or the PMS 280 colour specification.

Colour coding: Condition Graphs

The colour coding prescriptions of the TMH 22 for condition and functional categories were adopted for condition related graphs. These colours are shown below.

Colour palette for condition data		
Condition category	RGB Colour Code	Colour
Very Poor	255, 102, 204	
Poor	255,0,0	
Fair	255, 255, 0	
Good	0, 255, 0	
Very Good	0, 0, 255	

Colour coding: Other Graphs

The Tertiary Colour palette of the WCG Corporate Identity Guidelines was adopted for all graphs and visual presentations not related to condition. The colours are always used in the sequence as listed in the table below:

Tertiary Colour Palette for non-condition data		
Condition category	RGB Colour Code	Colour
5493	129, 173, 181	
5135	136, 94, 128	
397	190, 184, 0	
576	102, 142, 60	
1807	161, 40, 48	
151	255, 115, 0	
464	133, 87, 35	
1245	198, 146, 0	