

Manage RMM Projects

SARF **THE SOUTH AFRICAN NATIONAL ROADS AGENCY**

Welcome

I'VE COME HERE TO SHARE ALL MY EXPERIENCE AND KNOWLEDGE – IT'S UP TO YOU WHAT YOU TAKE AWAY

DODANA CONSULTING ENGINEERS (PTY) LTD

Lecturer: Marthinus Wilken

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Manage RMM Projects

Introduction

The purpose of this Learning material is to enable learners to be competent agency project managers, Route Managers, Site agents or persons of similar responsibility on Routine Road Maintenance (RRM) projects.

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WHY ROUTINE ROAD MAINTENANCE

- Roads are taken for granted without acknowledging their vital contribution to various aspects of society's well being.
- How affectively we manage our National Roads is key to the quality of the environment we live in.

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WHY ROUTINE ROAD MAINTENANCE

- The importance of RRM is generally underestimated in the preservation of the road infrastructure as an asset.
- SANRAL is using the RRM contracts for maintaining their asset and to extend its life expectancy.
- And for the development of targeted enterprises. – (Knowledge transfer)

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WHY ROUTINE ROAD MAINTENANCE

-  The RRM programme was established in 1998 with 6748 km National Roads.
-  Today more that 20 000km is covered by Routine Road maintenance contracts.
-  The Routine Road maintenance project has as primary object, the provision of a safe road environment for all road users.



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DOCUMENTATION

-  Documentation was developed to help the Site maintenance team to manage different projects to the same standards.
-  It helps to assist those involve in RRM to identify remedial actions to be taken to preserve and render the road safe.






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DOCUMENTATION

SANRAL

OPERATIONAL MANUALS

-  Site Management System.
-  RRM Guidance Manual.
-  Financial Management user Manual.







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DOCUMENTATION

SANRAL

OPERATIONAL MANUALS - OTHER

-  National Slope Management System.
-  Road Incident Management System.
-  Drainage Manual.
-  Bi-Annual Bridge, Culvert and Gantry Inspections.




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DOCUMENTATION

OTHER REFERENCES

- 🚧 Bituminous Pavement Repairs; General Repairs and patching.(SABITA)
- 🚧 South African Road Traffic Signs Manual (Chapter 13)
- 🚧 Problem vegetation of South Africa.
- 🚧 Occupational Health and Safety Act.


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DOCUMENTATION

SPECIFICATIONS

- 🚧 Standard Specifications RRM April 2019,
- 🚧 Standard Specifications for road and bridge works; COLTO; 1998 for the Community development project.
- 🚧 Proforma Contract Document.


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DOCUMENTATION

CONTRACT DOCUMENTS

- 🚧 **VOLUME 1: FIDIC Conditions of Contract.**
- 🚧 **VOLUME 2: Standard Specification for RRM.**
- 🚧 **VOLUME 3: The Project Document includes:**
Condition of Tender , Particular Condition of Contract , Scope of Works and Returnable Forms.
- 🚧 **VOLUME 4: The standard Drawings.**
- 🚧 **VOLUME 5: Condition Report**

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Manage RRM Projects

Introduction



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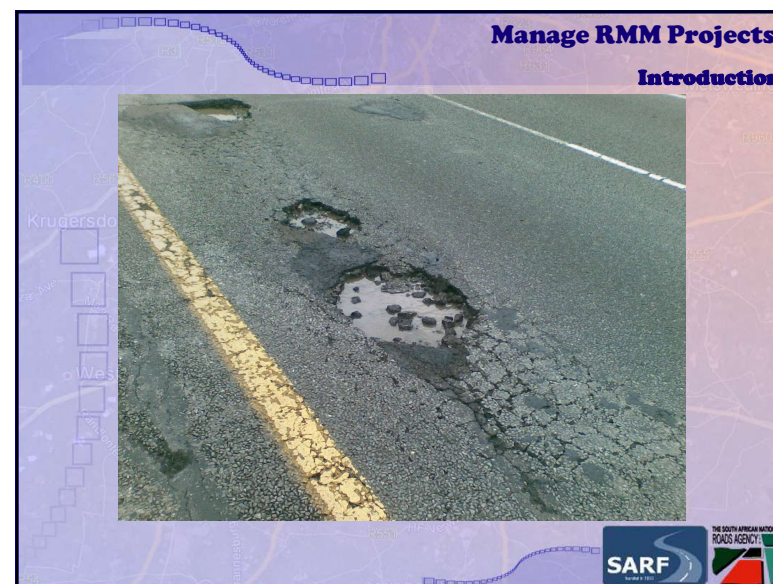
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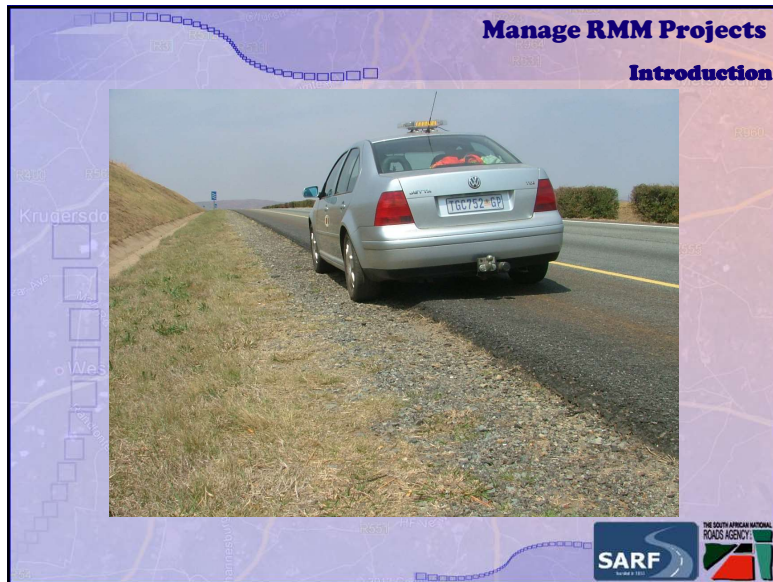
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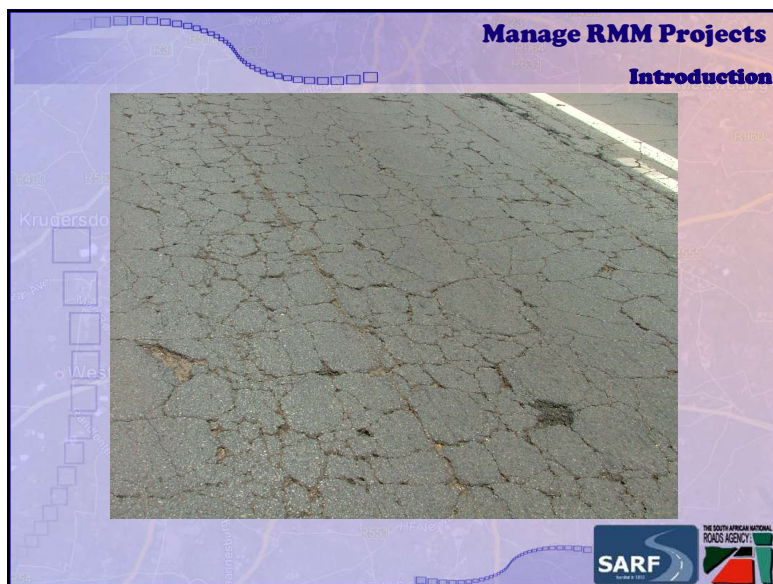
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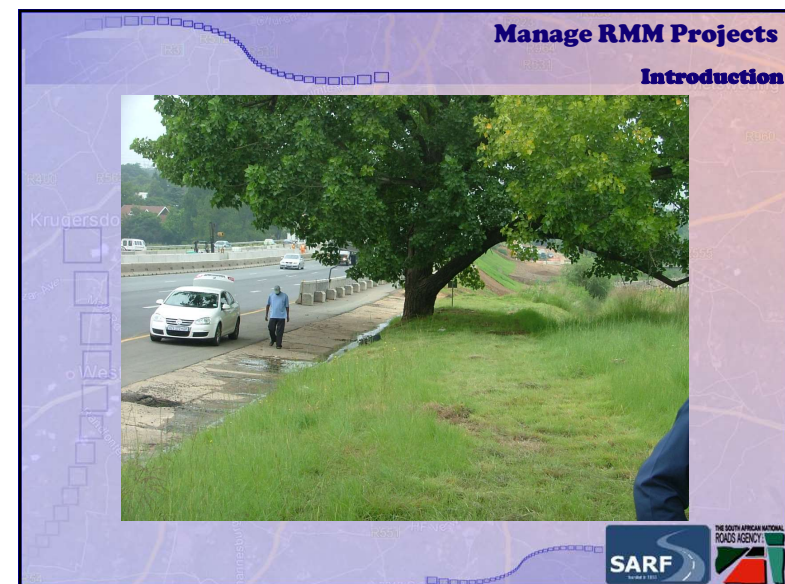
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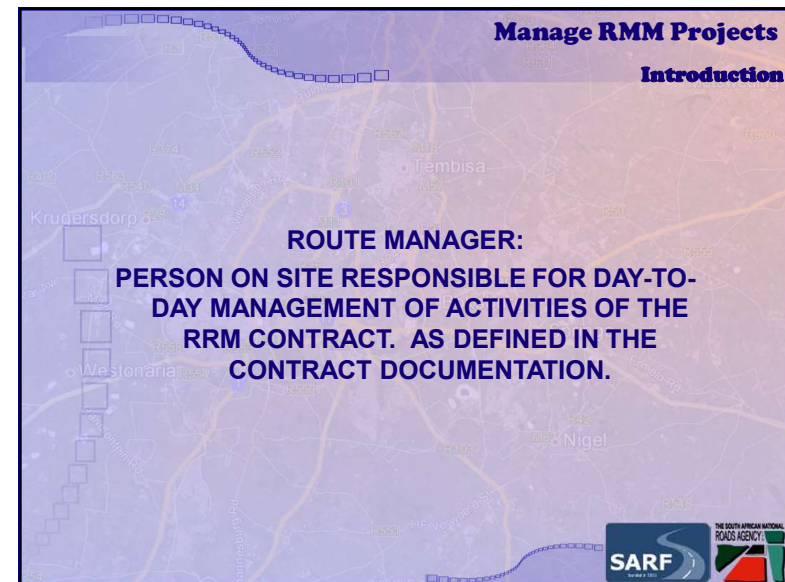
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Manage RMM Projects

Introduction

Specific Outcome 1: Preparation

You will have the knowledge to do the necessary preparation work before the contract phase of a Routine Road Maintenance (RRM) project

- Compile/update an inventory within the road reserve
- Conduct/update a condition assessment within the road reserve
- Prioritize maintenance needs

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Introduction

Specific Outcome 2: Contract Documents & Tenders

You will have the knowledge to prepare and manage the documentation required for the RRM project

- Develop contract documents with applicable specifications
- Develop a Bill of Quantities
- Identify work activities reserved for targeted enterprises and specialist sub-contractor activities
- Be able to tender for each activity and to determine a unit rate, for use in a RRM projects and to develop method statements
- Manage the tender process from advertising to adjudication and appointment of contractors

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Introduction

Specific Outcome 3: Manage, Coordinate & Operate

You will have the knowledge to manage, coordinate and operate a RRM project


- Develop monthly schedules and match this with a budget provided
- Manage, coordinate and operate the RRM contract as per the Road Agency's Guidance Documents.
- Ensuring compliance to the contract documentation by all parties involved in the RRM contract
- Do financial management of the RRM contract in accordance with the Road Agency's financial management.

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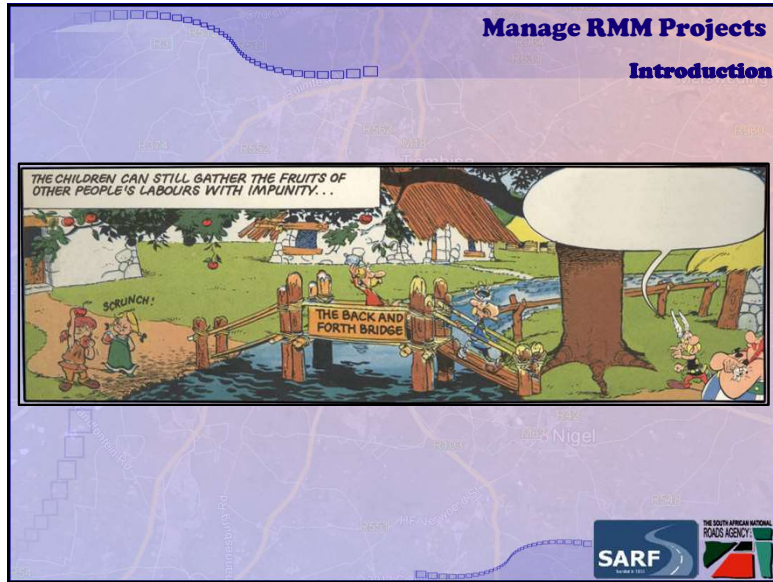
Manage RMM Projects

Introduction

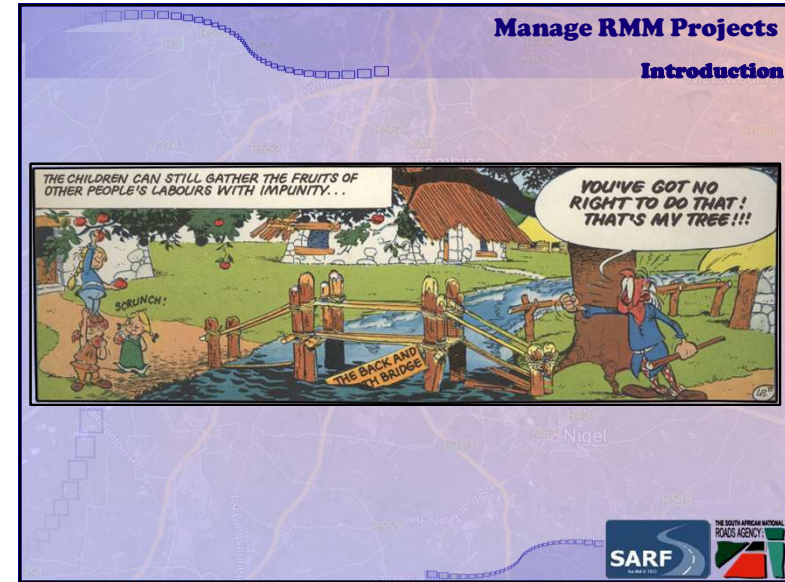


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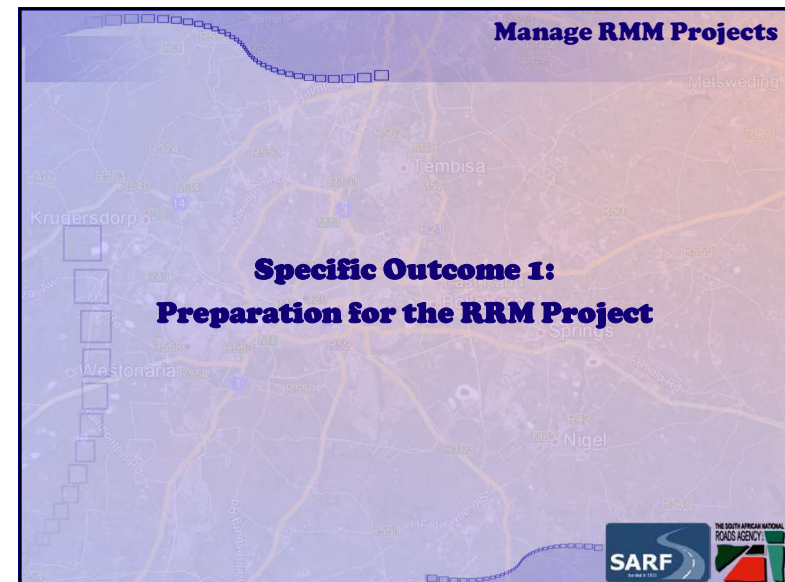
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Manage RMM Projects Preparation for the RRM Project

This Specific Outcome will enable you to:

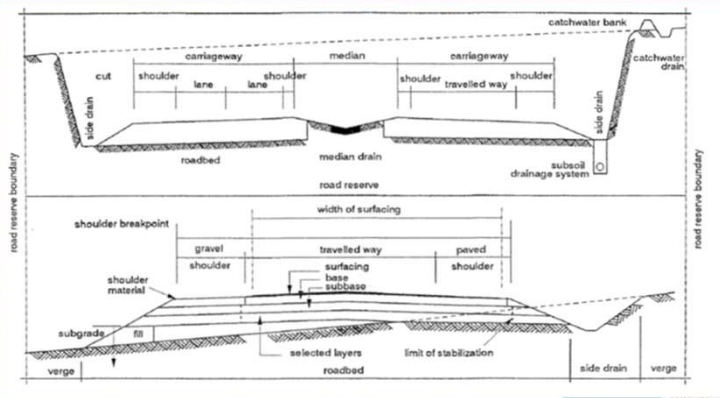
- Conduct an inventory and a condition assessment of all assets within the road reserve
- Identify maintenance needs
- Prioritise maintenance needs
- Schedule prioritised needs and recurring maintenance activities




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Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment

1.1.1 Road Reserve
1.1.1.1 Boundaries



Road reserve



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Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment

1.1.1 Road Reserve
1.1.1.1 Boundaries

S.G. OFFICE DIAGRAM

STATION	CHORD BEARING	CHORD DISTANCE	CHORD AREA	S.G. No.
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5+00	17° 00' 00" 00" 00"	100.00	100.00	5
6+00	17° 00' 00" 00" 00"	100.00	100.00	6
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S.G. OFFICE DIAGRAM

Approved: [Signature]

Surveyor-General


Sheet 2 of 2

Scale: 1:1000

Surveyed in October 1999

By: [Signature]

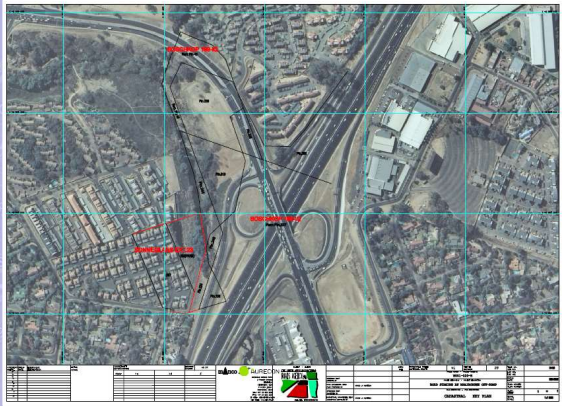
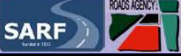
J. de Vries, PLS 9390 Professional Land Surveyor



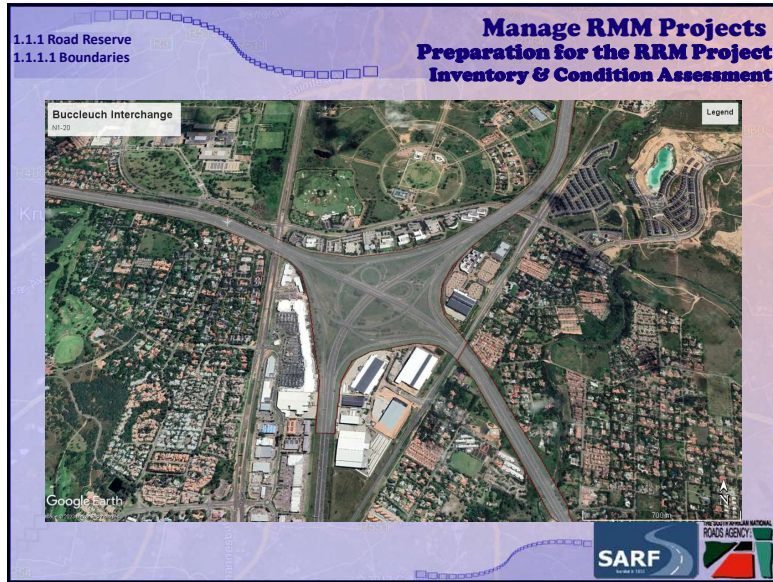
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Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment

1.1.1 Road Reserve
1.1.1.1 Boundaries

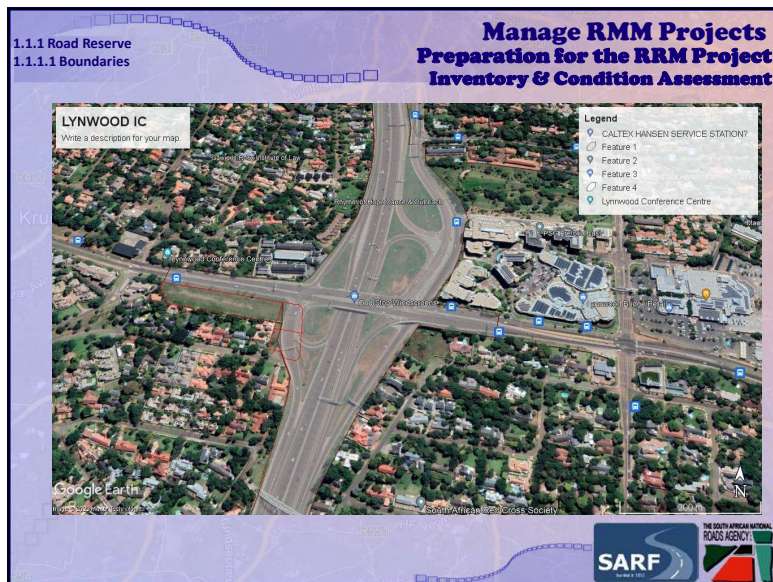
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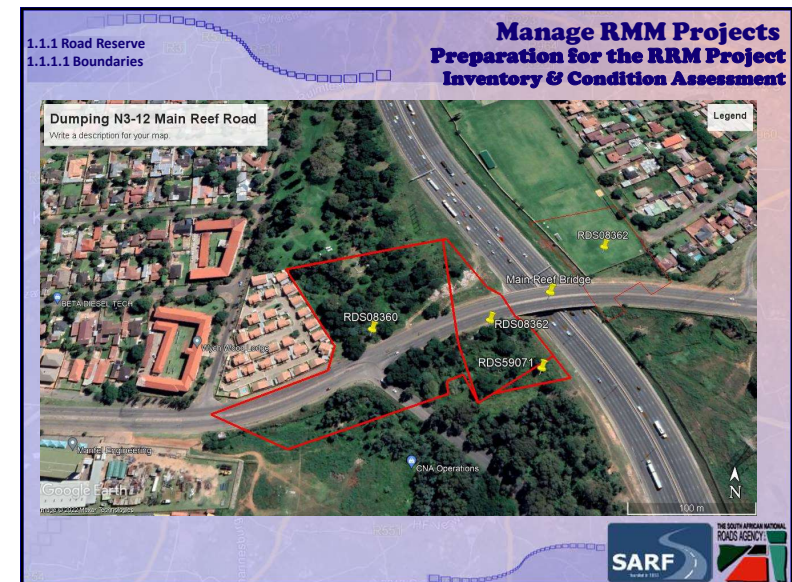
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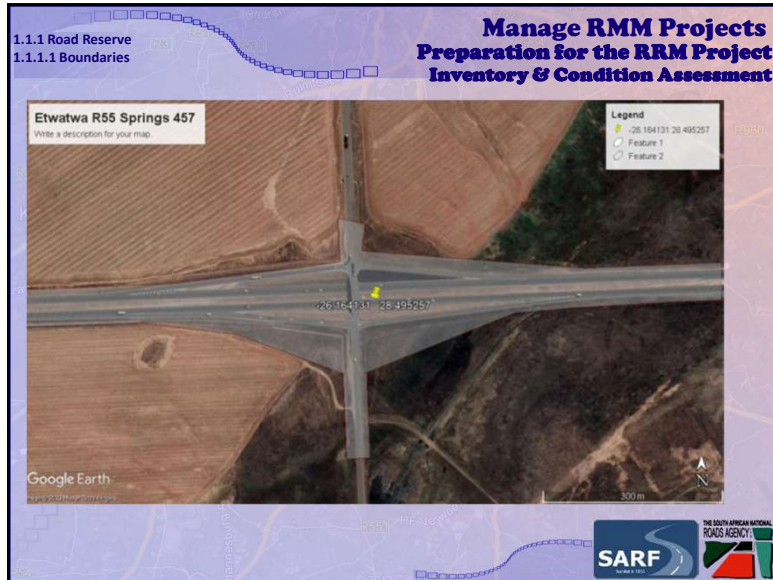
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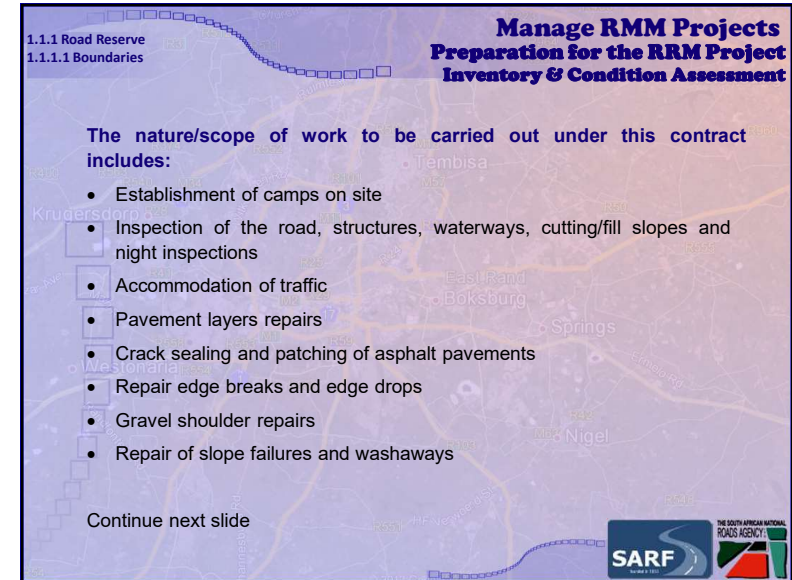
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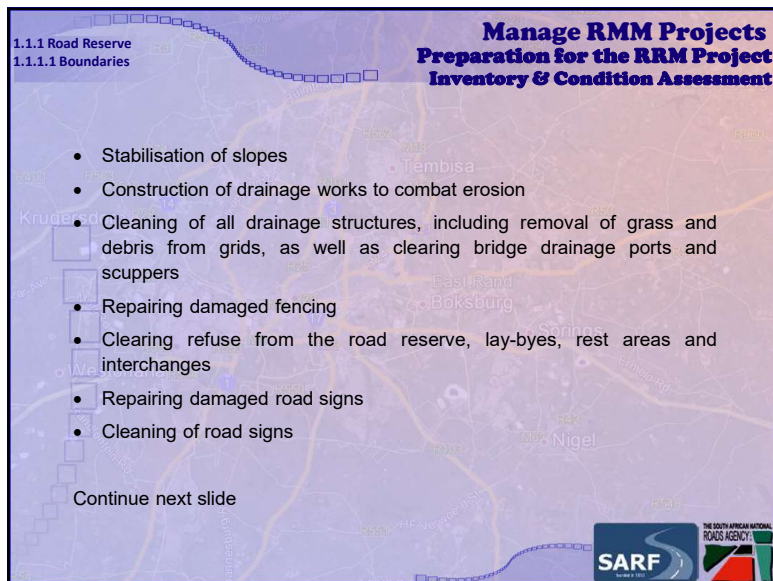
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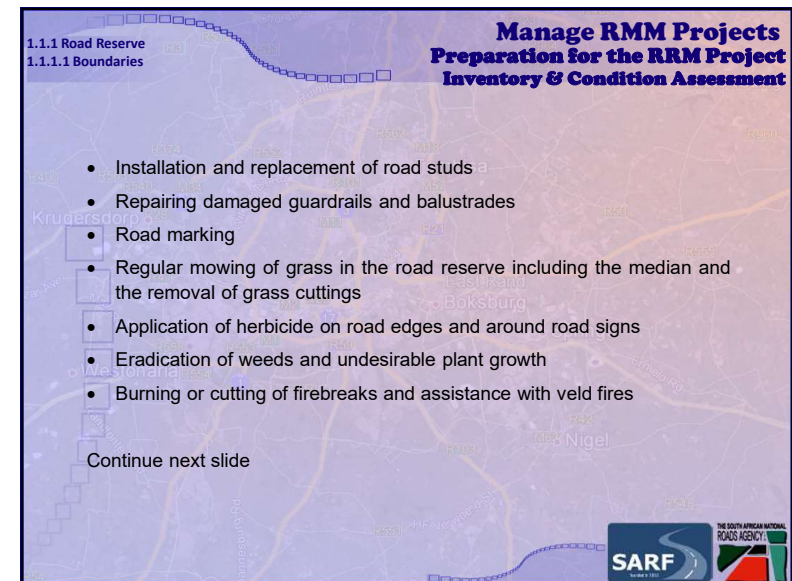
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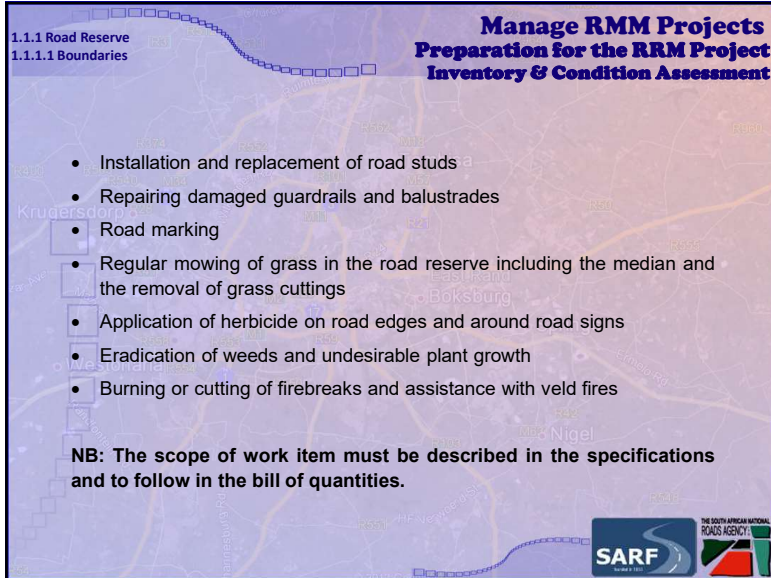
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.1 Road Reserve
1.1.1.1 Boundaries

- Installation and replacement of road studs
- Repairing damaged guardrails and balustrades
- Road marking
- Regular mowing of grass in the road reserve including the median and the removal of grass cuttings
- Application of herbicide on road edges and around road signs
- Eradication of weeds and undesirable plant growth
- Burning or cutting of firebreaks and assistance with veld fires

NB: The scope of work item must be described in the specifications and to follow in the bill of quantities.



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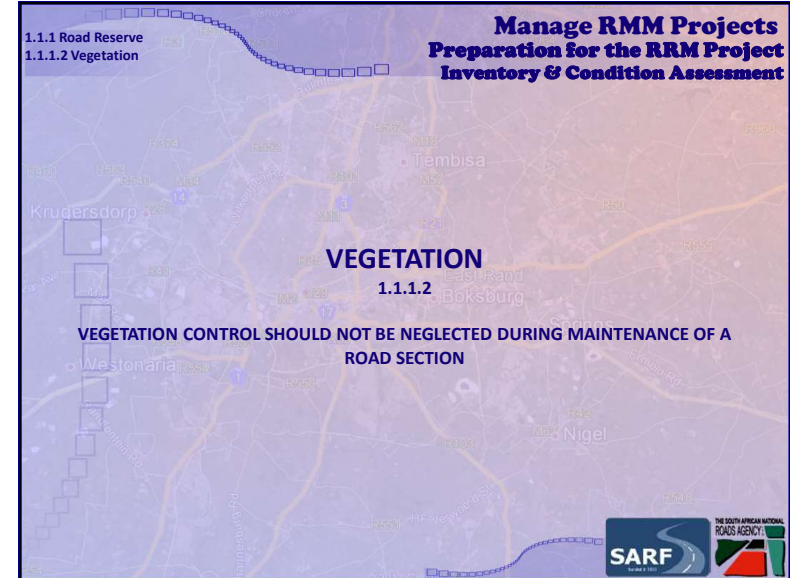
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.1 Road Reserve
1.1.1.2 Vegetation

VEGETATION
1.1.1.2

VEGETATION CONTROL SHOULD NOT BE NEGLECTED DURING MAINTENANCE OF A ROAD SECTION



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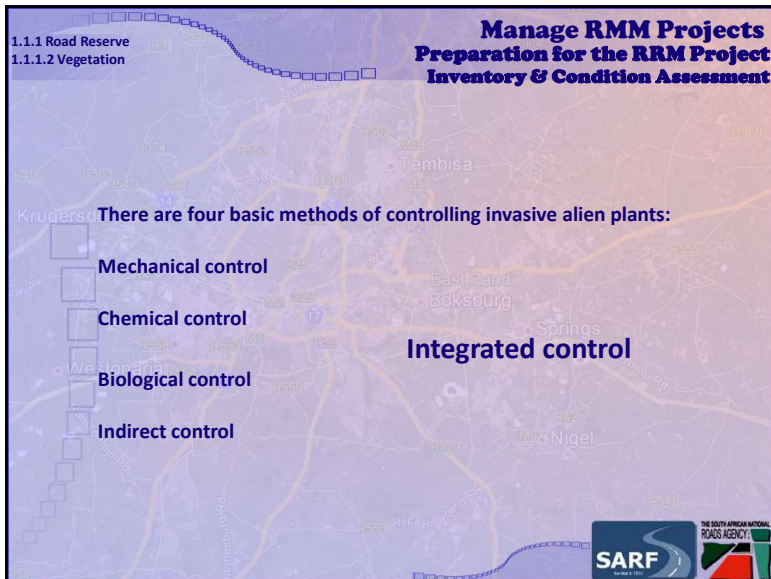
**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.1 Road Reserve
1.1.1.2 Vegetation

There are four basic methods of controlling invasive alien plants:

- Mechanical control
- Chemical control
- Biological control
- Indirect control

Integrated control



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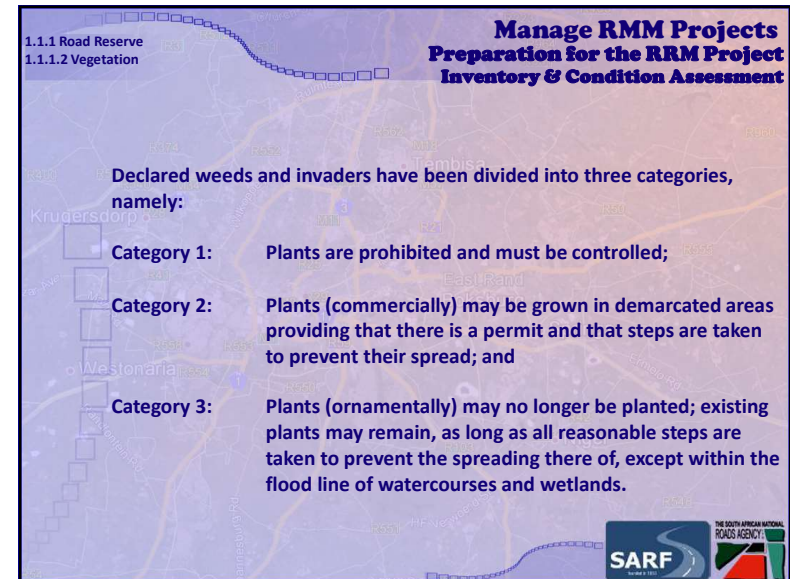
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.1 Road Reserve
1.1.1.2 Vegetation

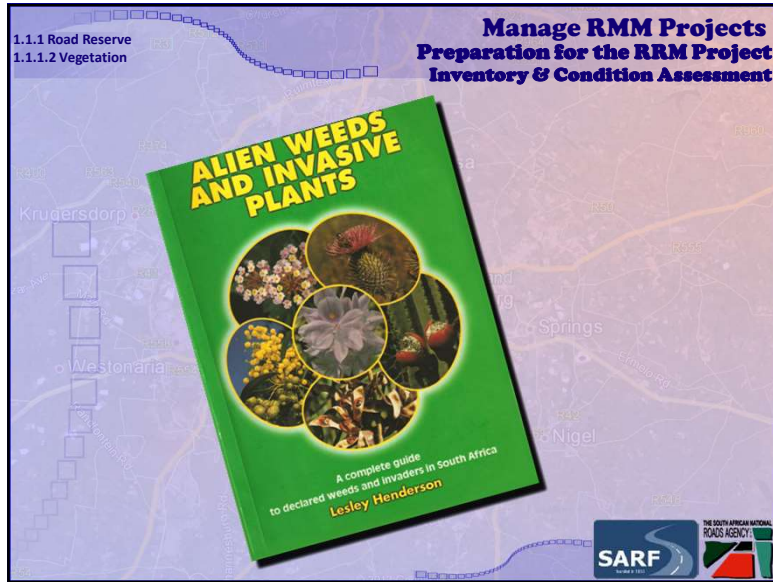
Declared weeds and invaders have been divided into three categories, namely:

- Category 1:** Plants are prohibited and must be controlled;
- Category 2:** Plants (commercially) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread; and
- Category 3:** Plants (ornamentally) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

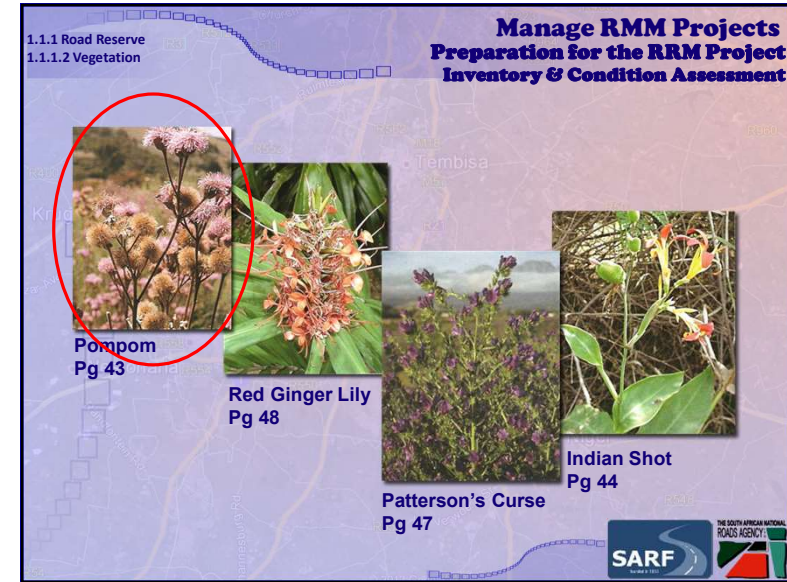


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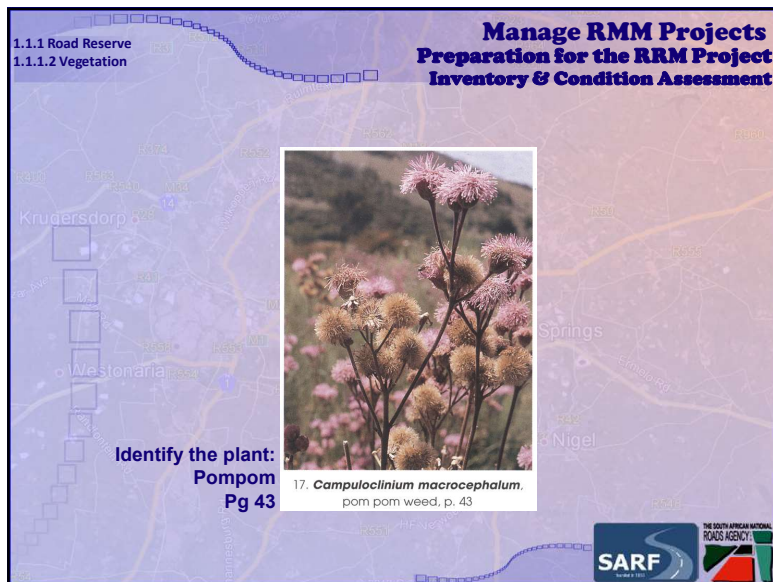
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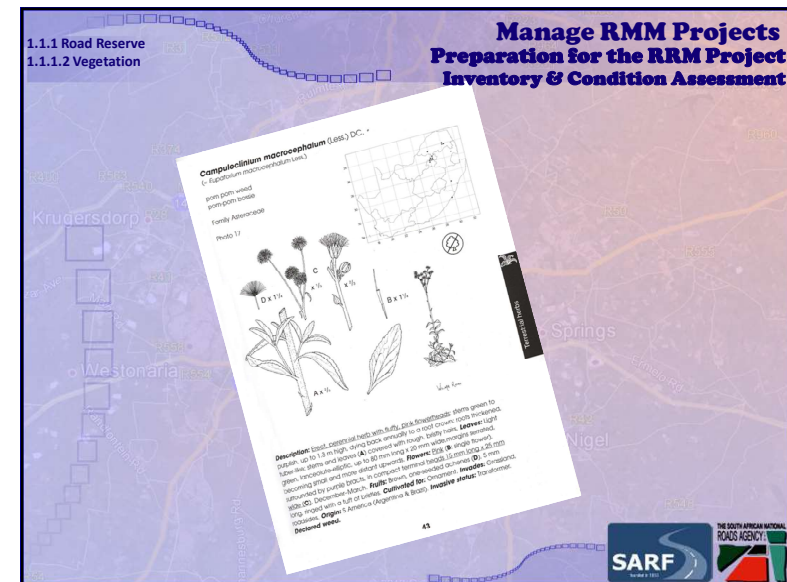
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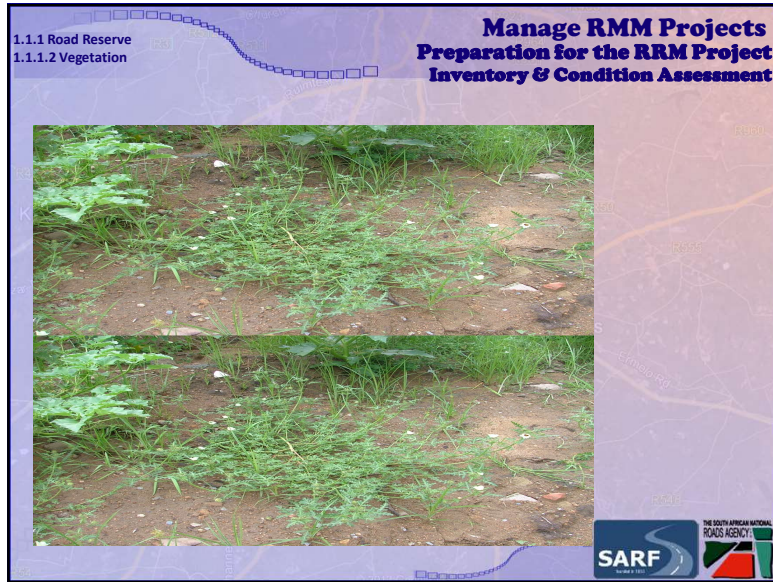
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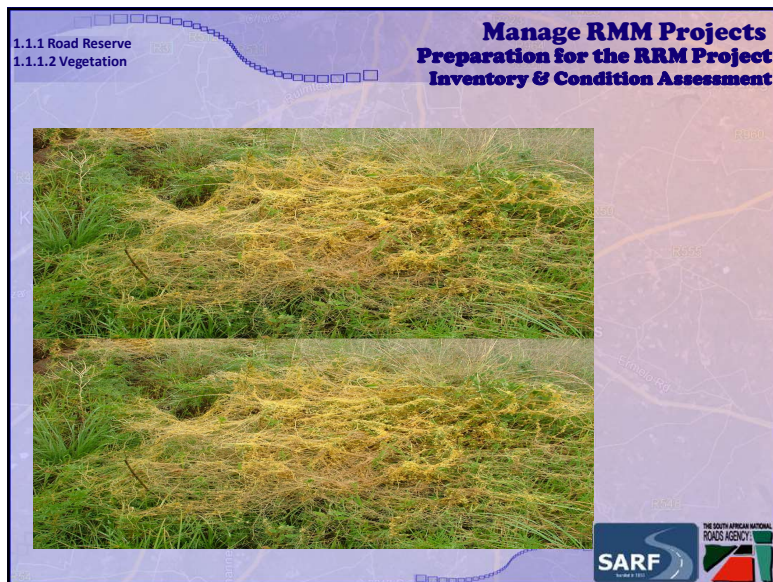
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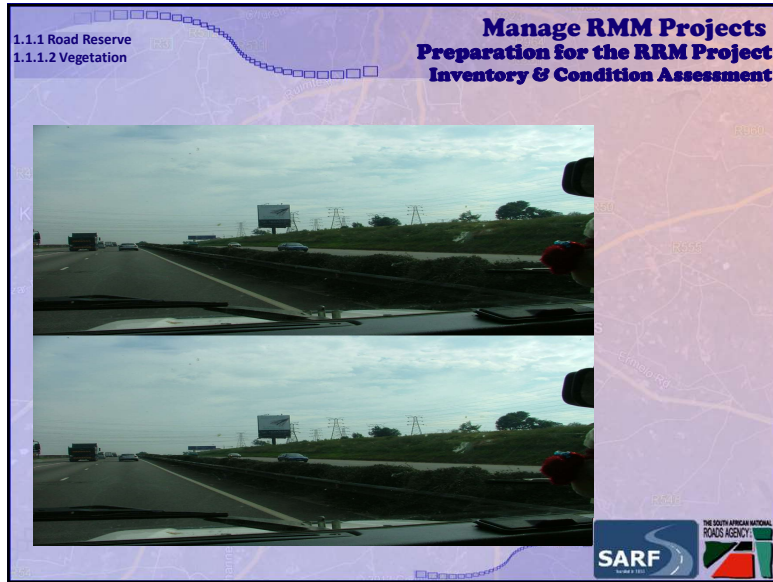
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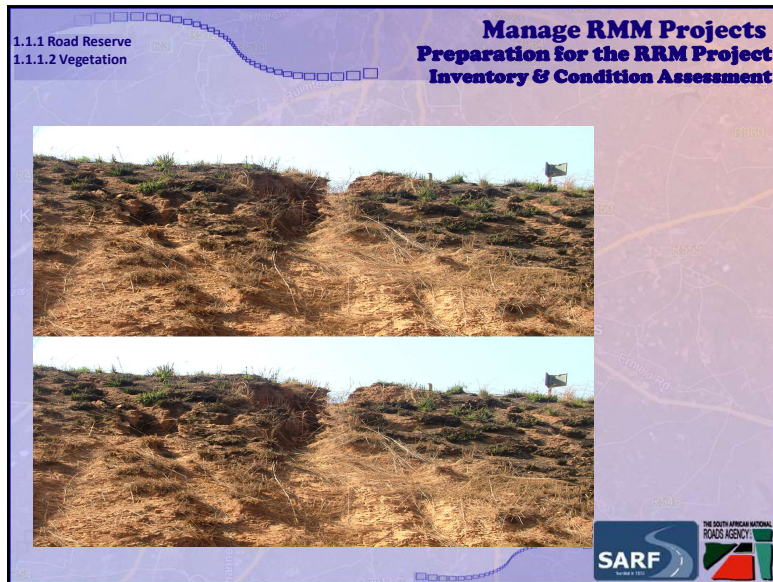
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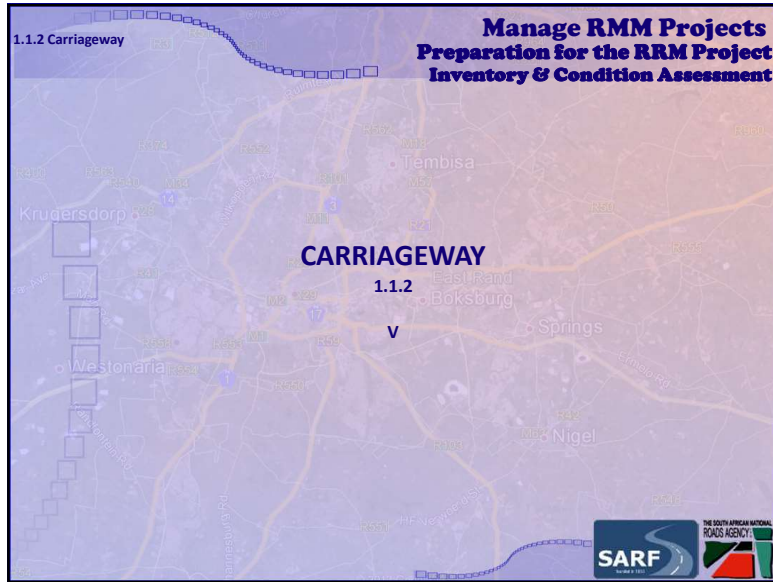
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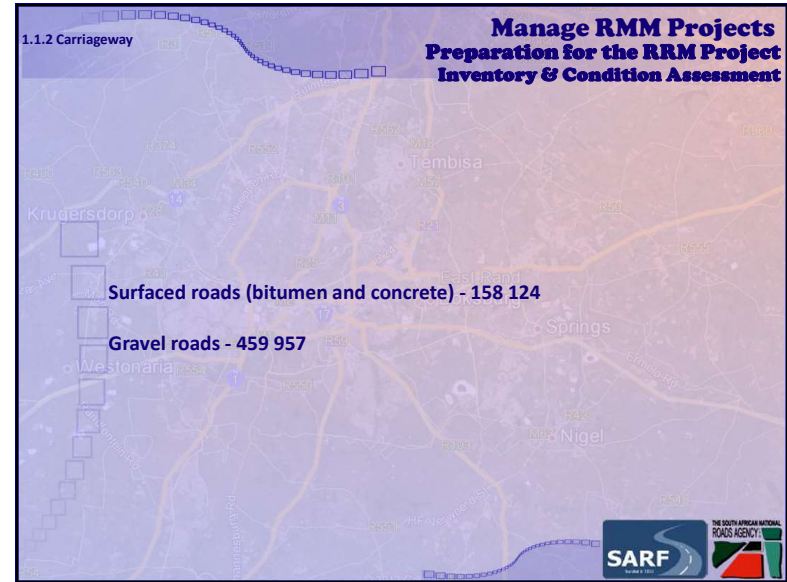
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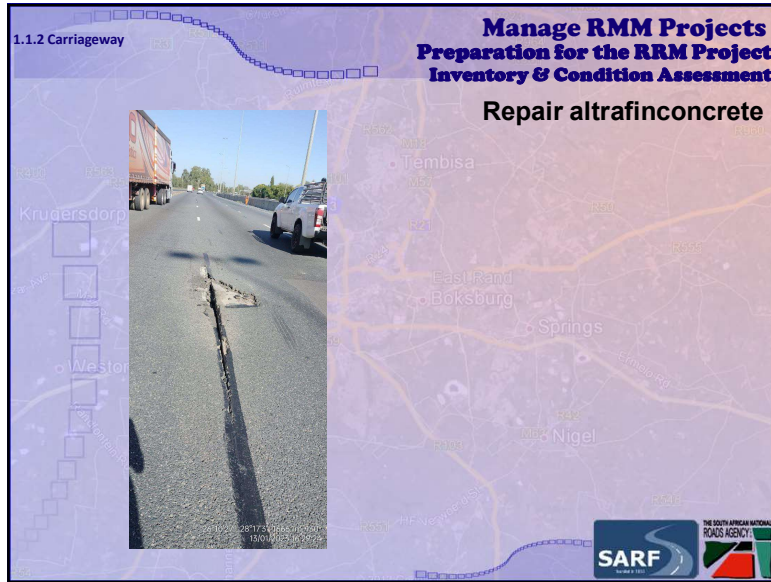
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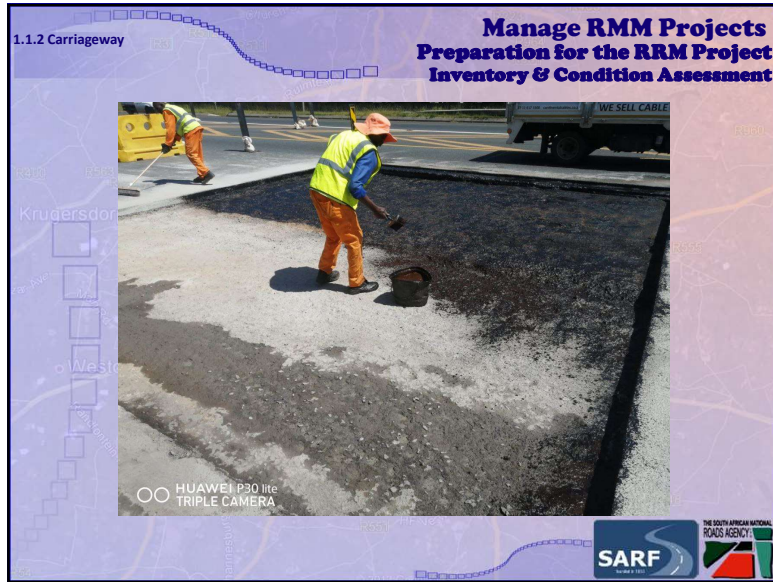
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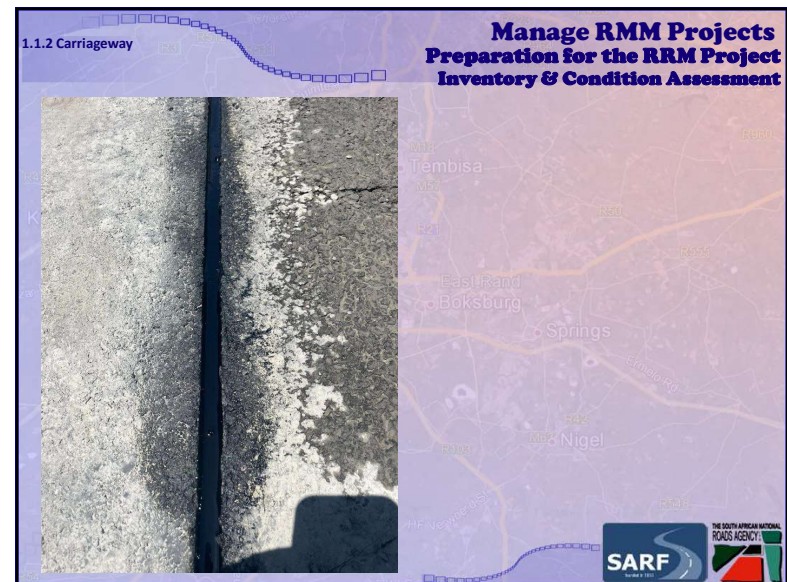
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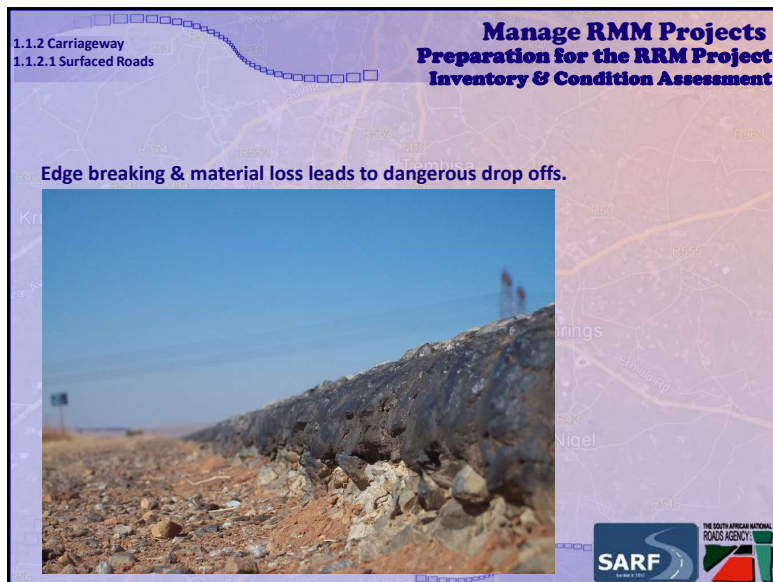
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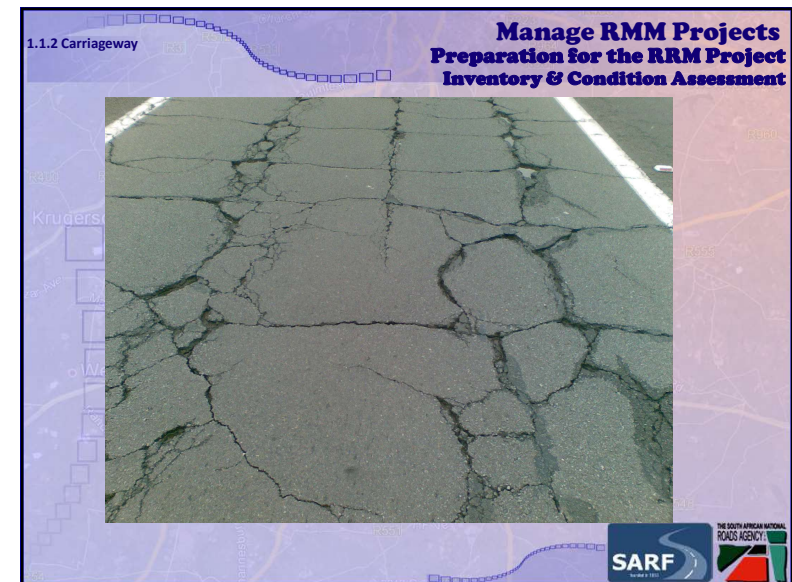
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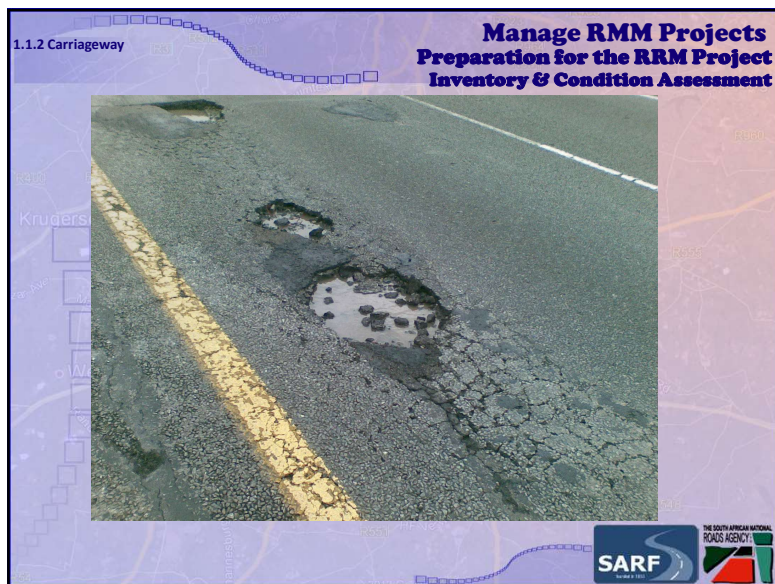
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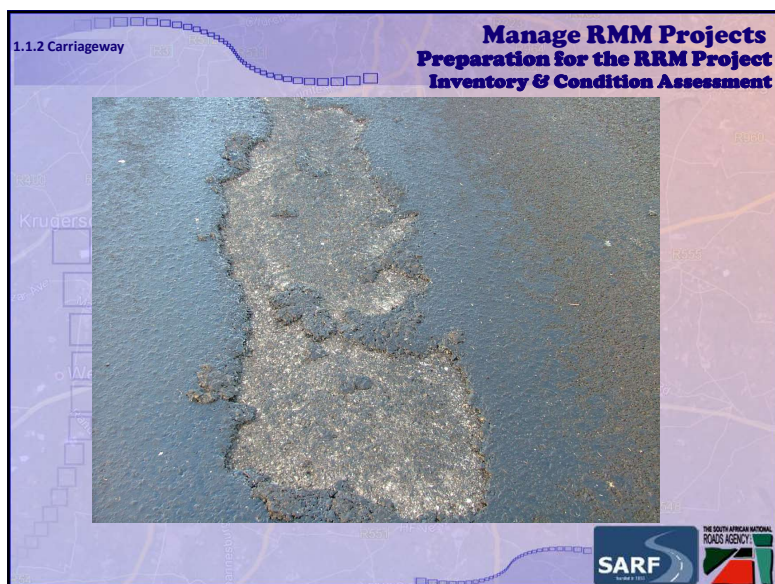
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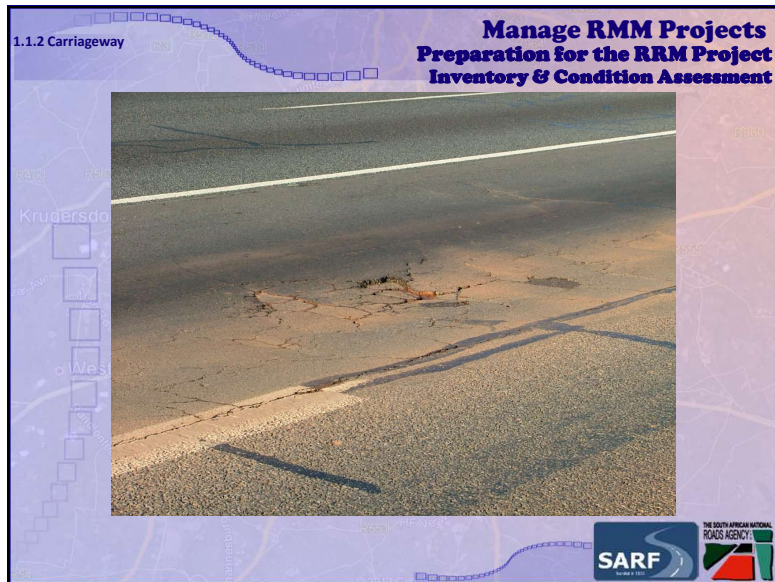
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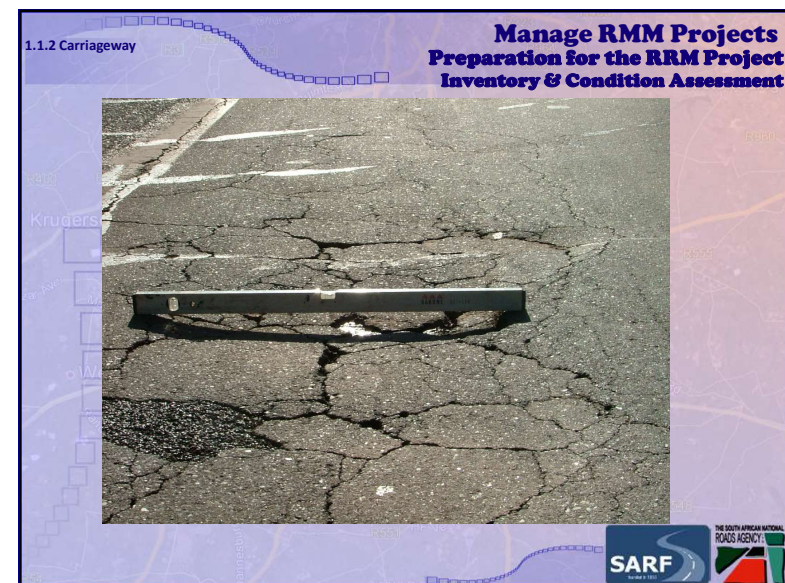
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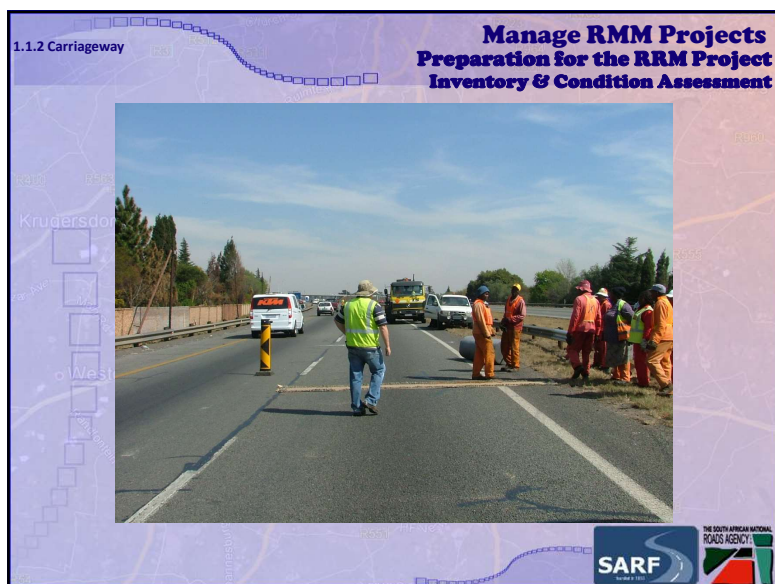
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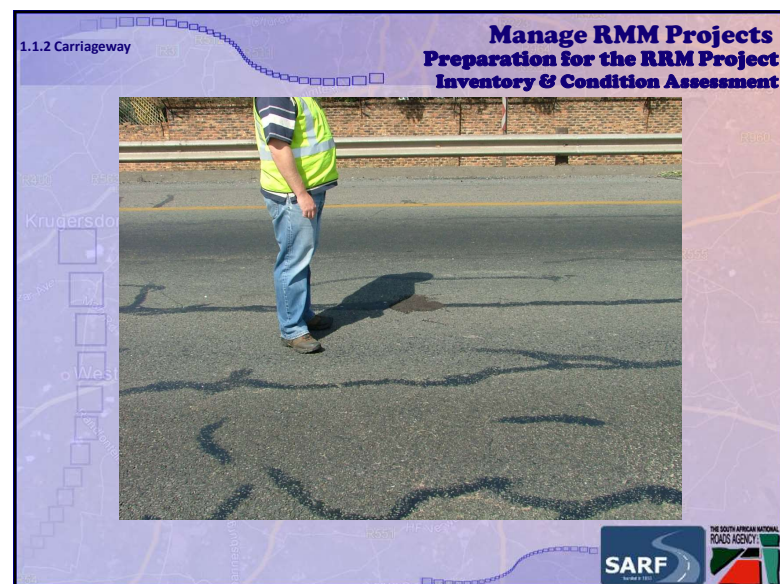
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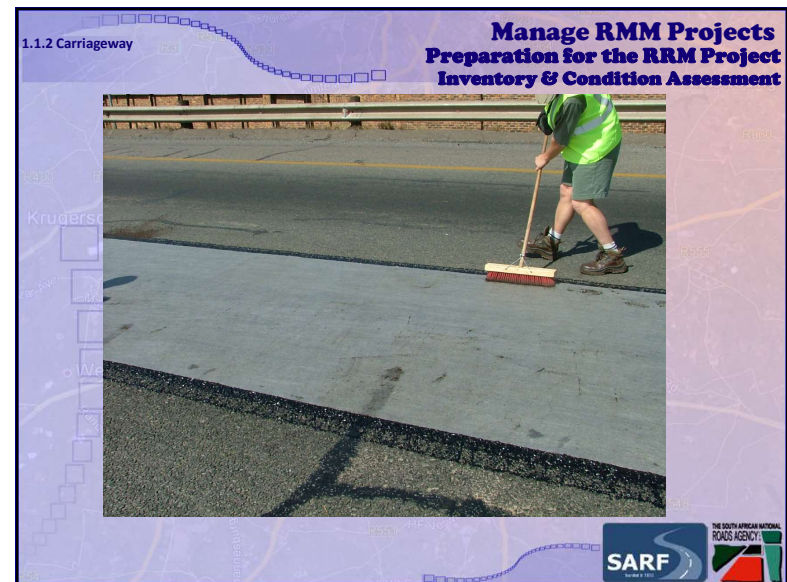
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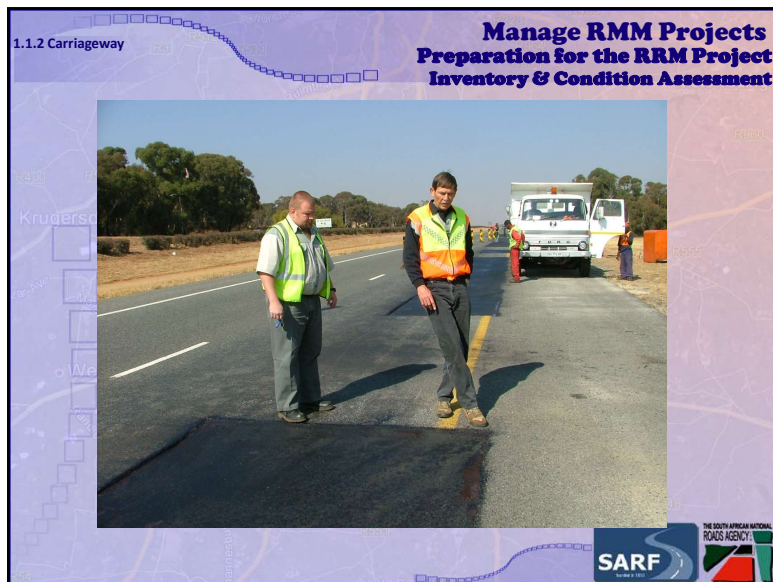
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founded in 1995

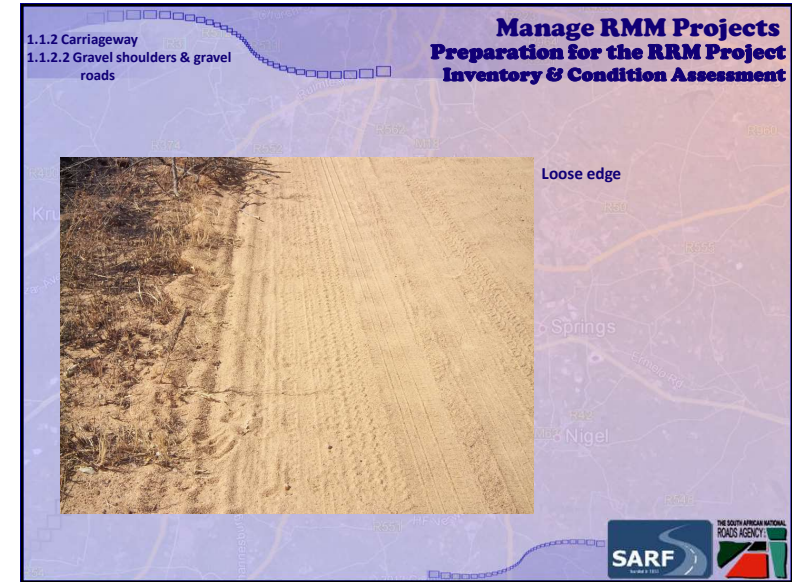
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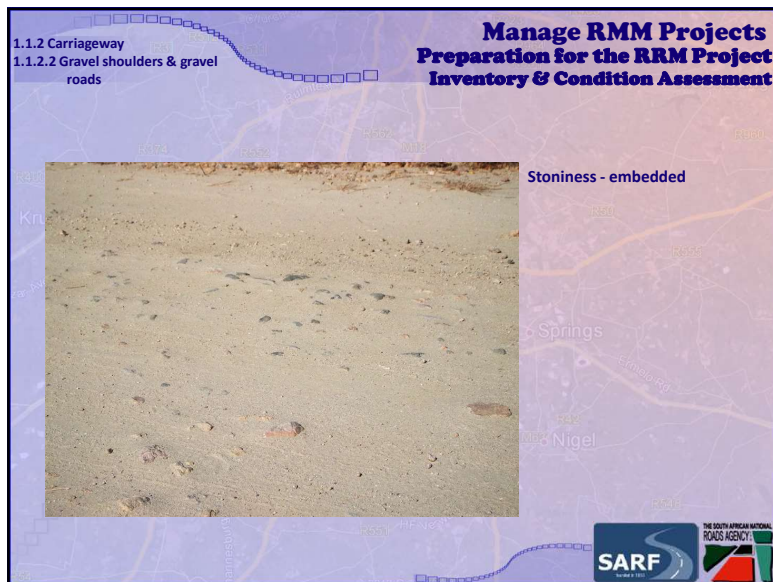
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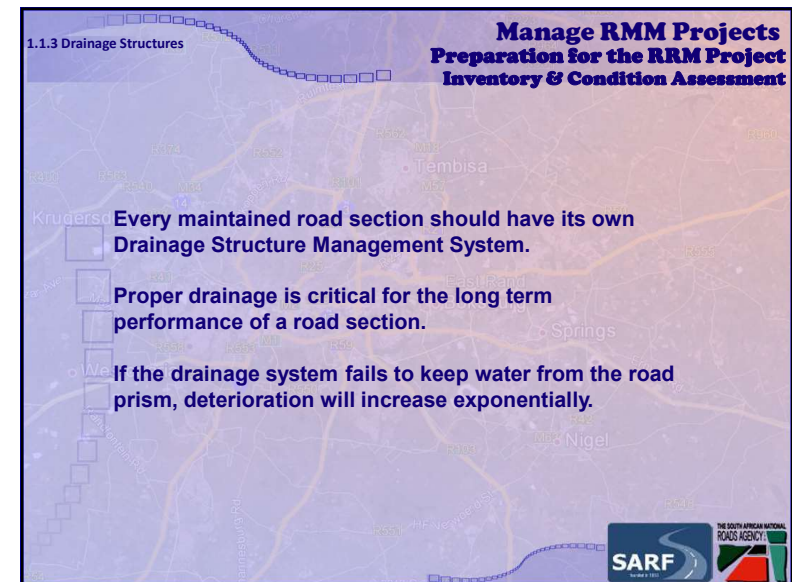
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1.1.3 Drainage Structures


Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment



Opening width $< 1.2\text{M}$




A Combined opening $\leq 5\text{M}^2$




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1.1.3 Drainage Structures

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment




Cellular structure with clear span length $\geq 1.2\text{M}$



Or
Diameter $\geq 2.1\text{M}$


Culvert with total cross-sectional opening $\geq 5\text{M}^2$



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1.1.3 Drainage Structures

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment




Clear span $> 6\text{M}$

AND




Individual clear spans $> 1.5\text{M}$ & overall length between abutment faces $> 20\text{M}$

AND




Opening height at inlet $> 6\text{M}$

AND



Total cross-sectional opening $\geq 36\text{M}^2$

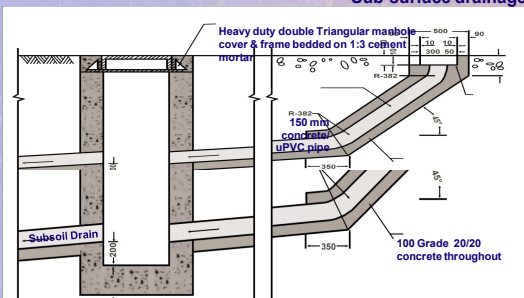


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1.1.3 Drainage Structures

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment



Sub-surface drainage



MANHOLE

RODDING EYE

Section 1-1
Series 1 - 25

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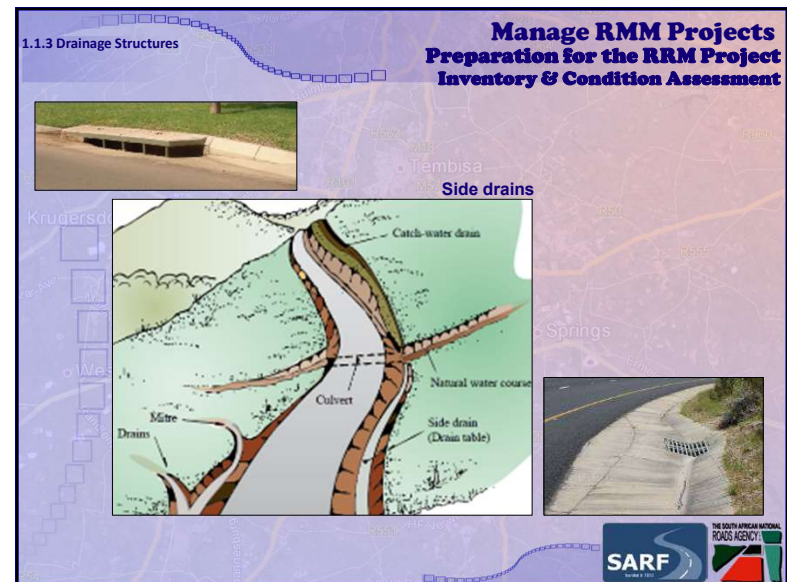
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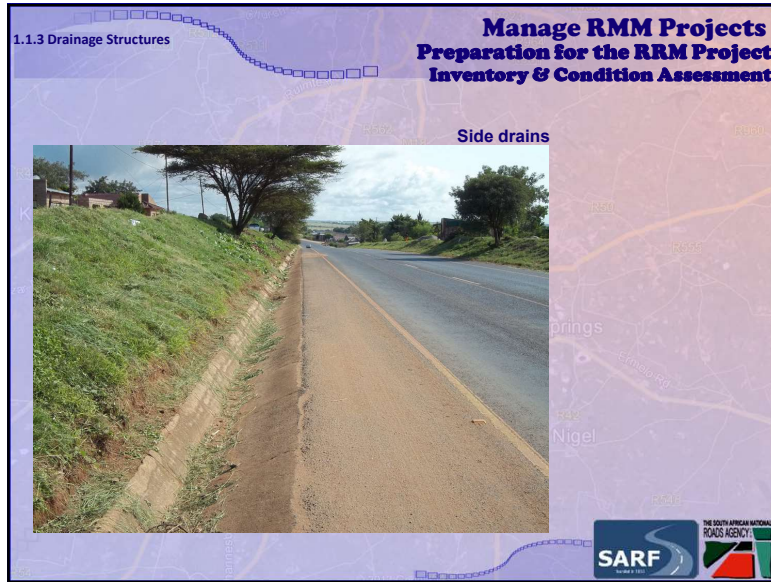
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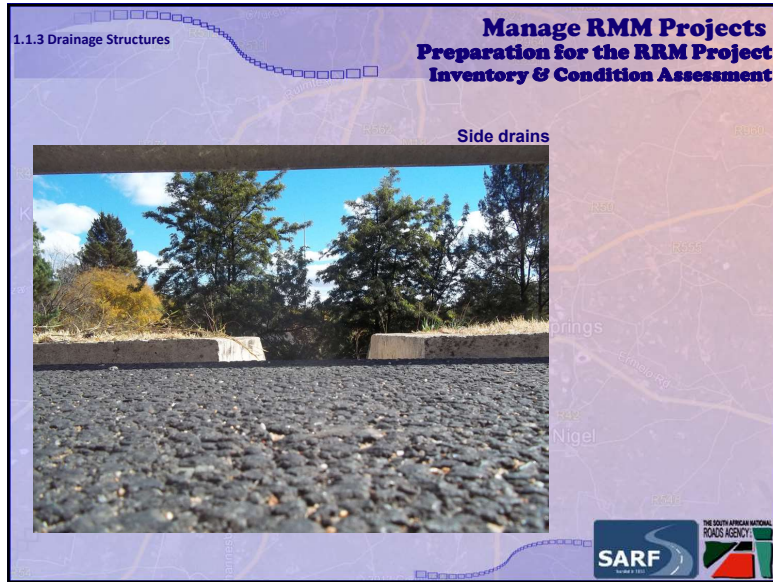
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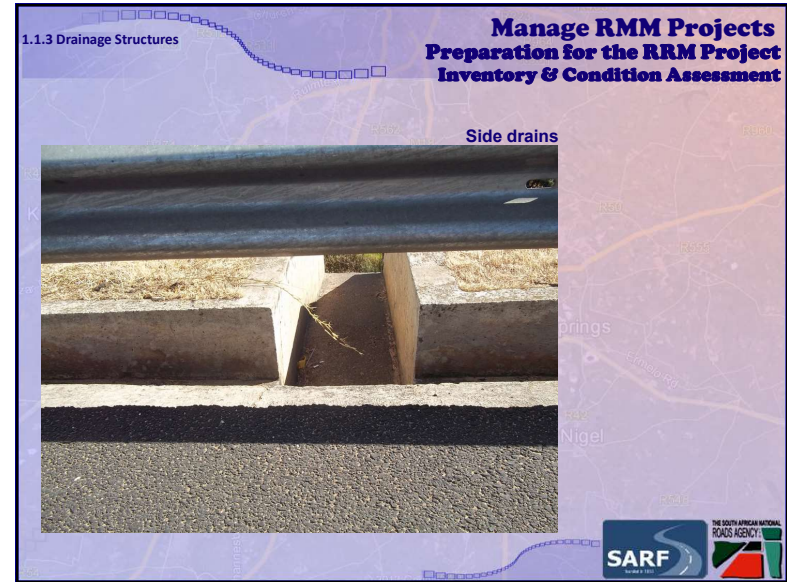
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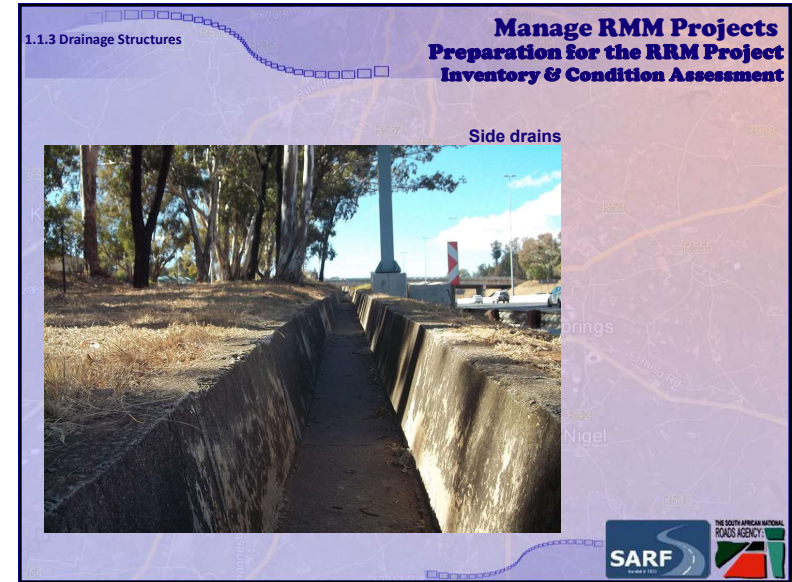
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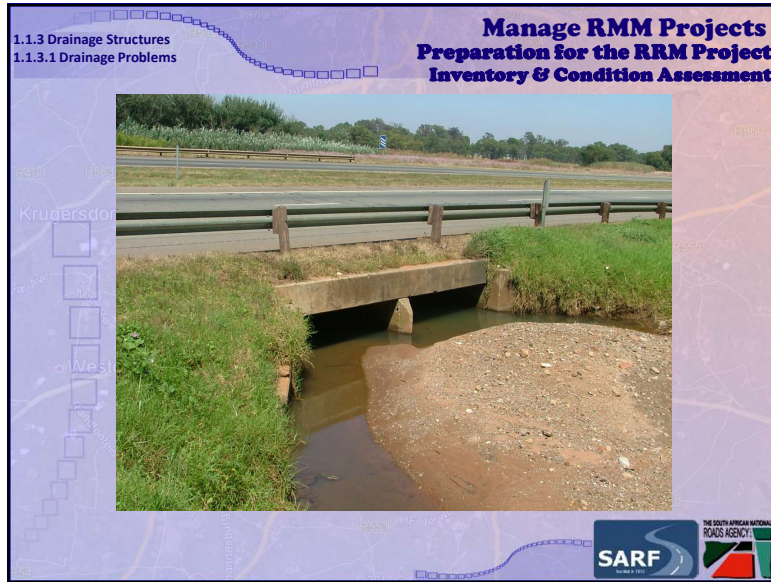
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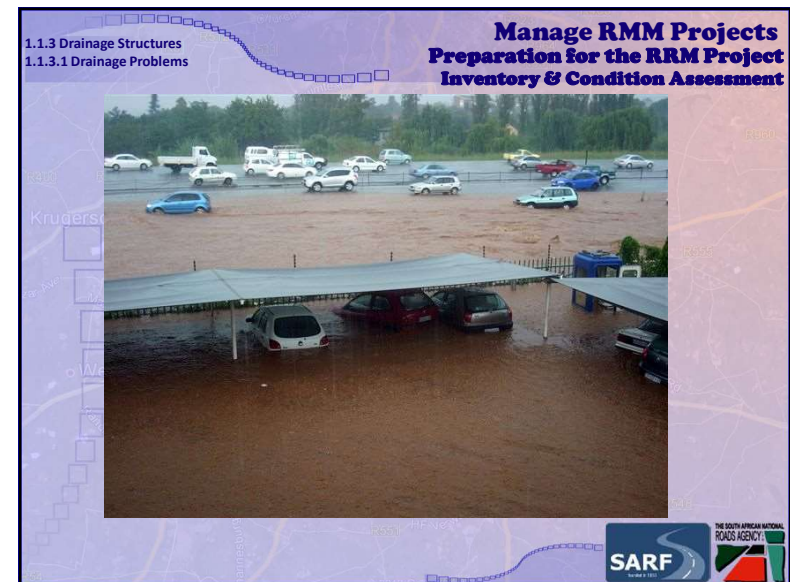
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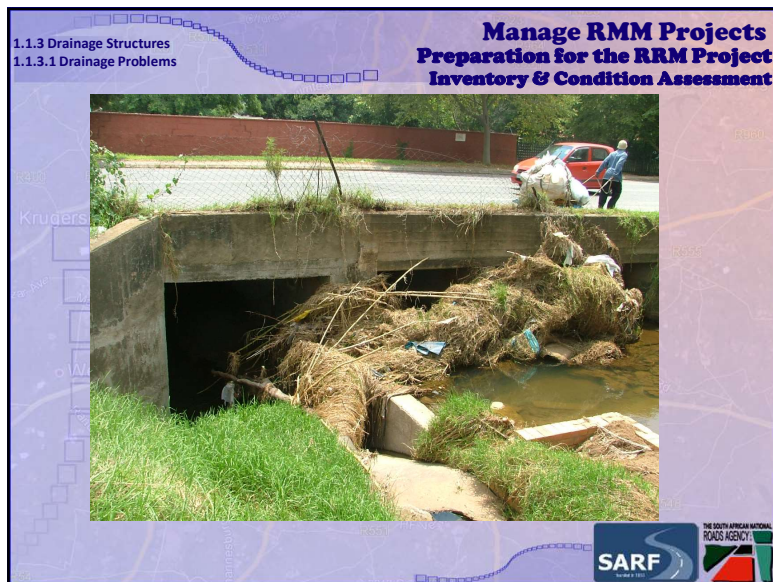
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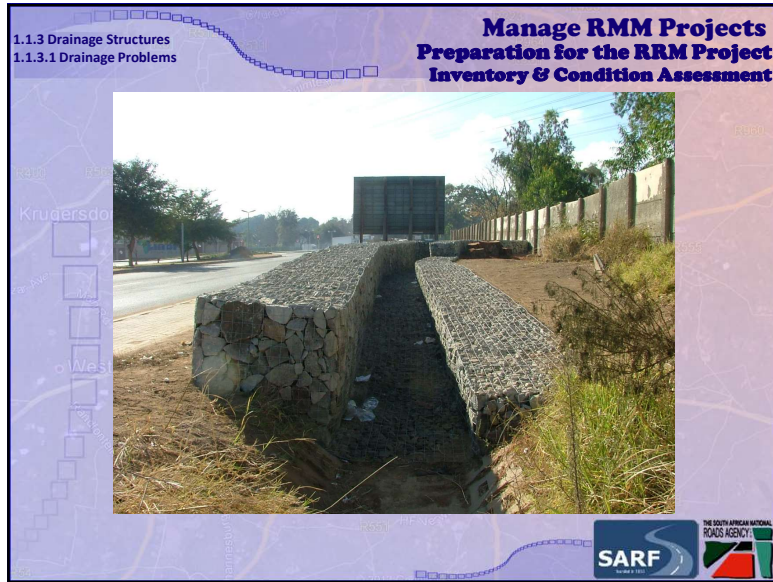
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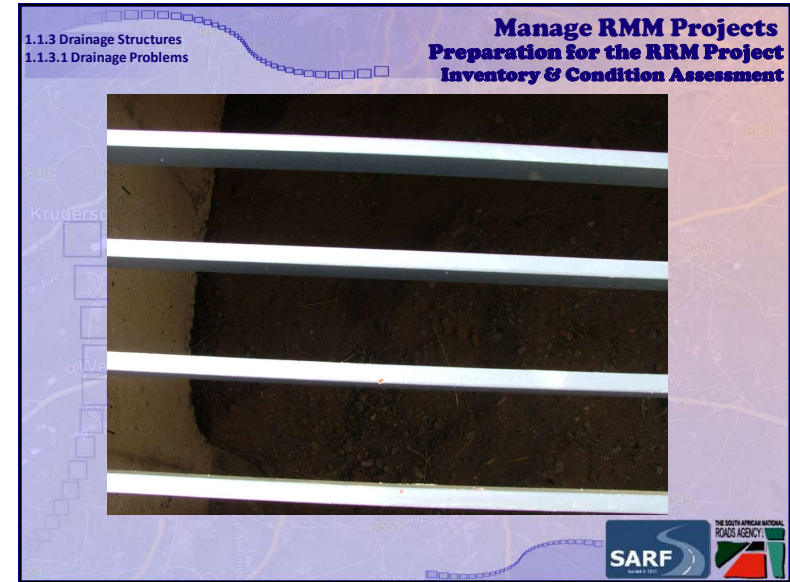
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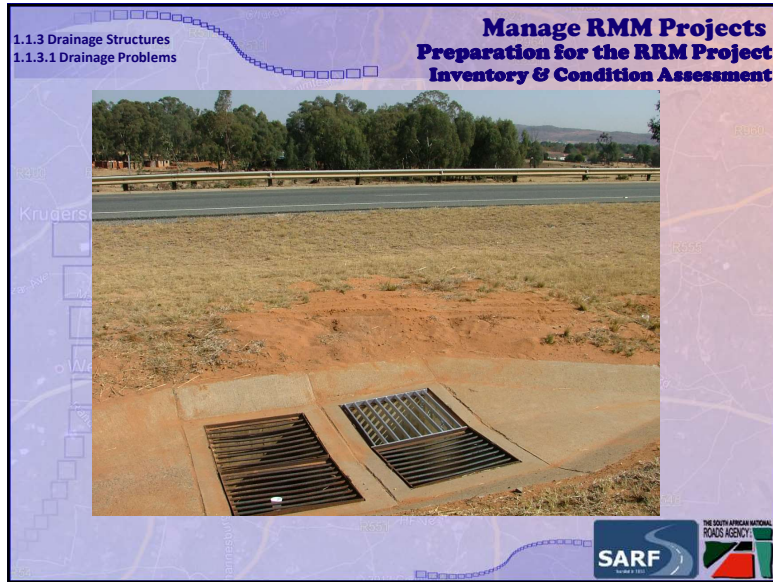
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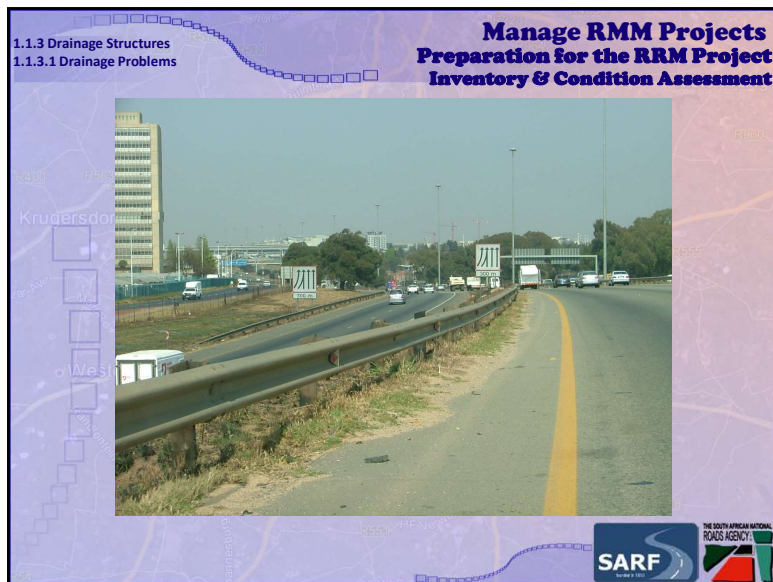
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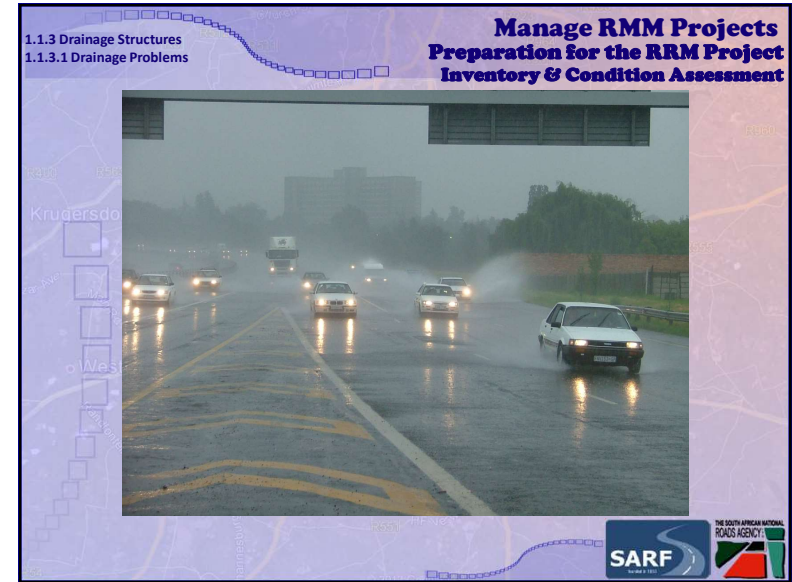
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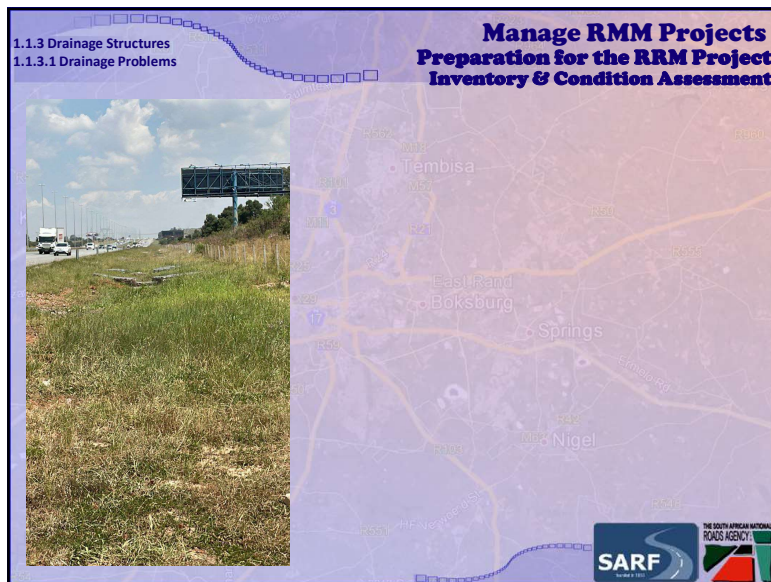
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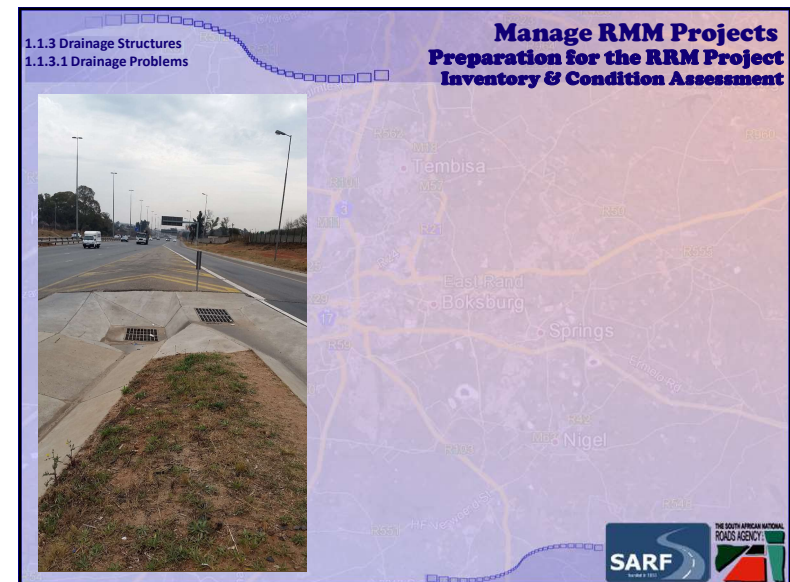
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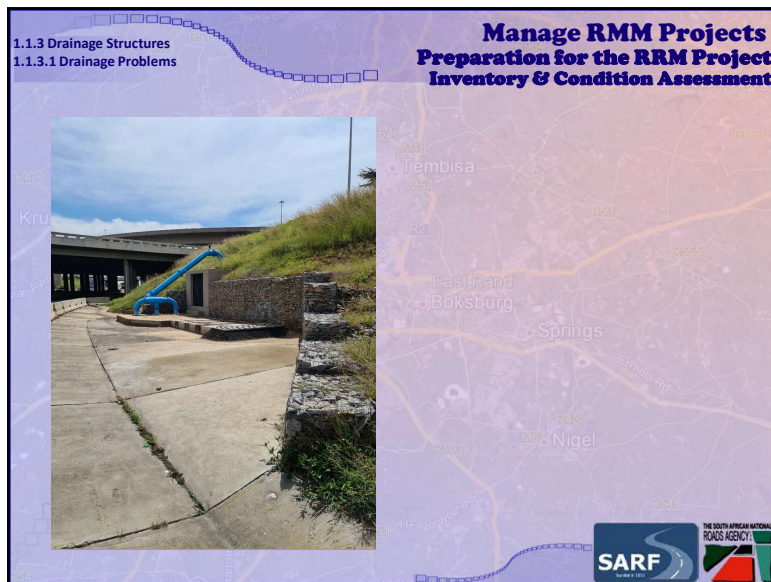
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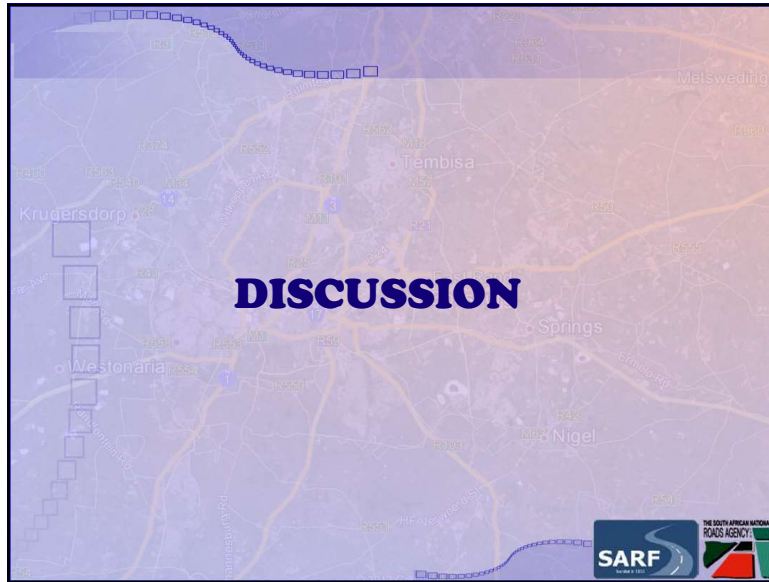
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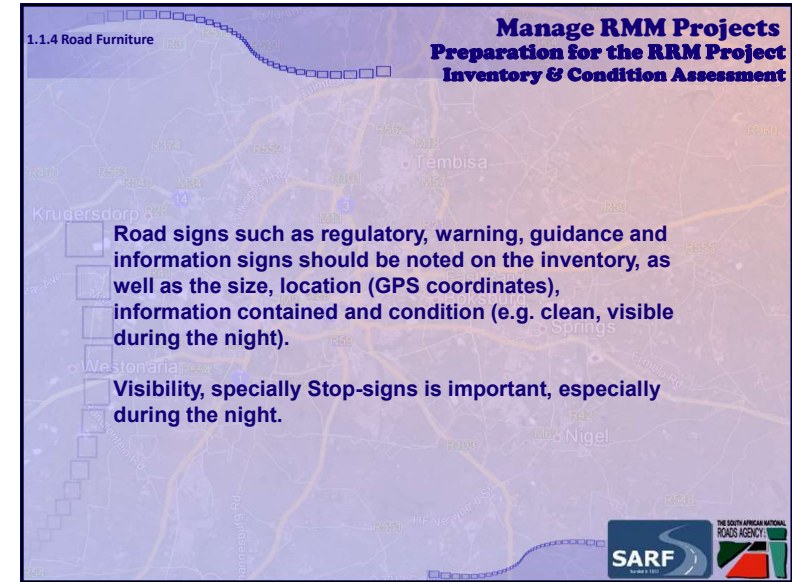
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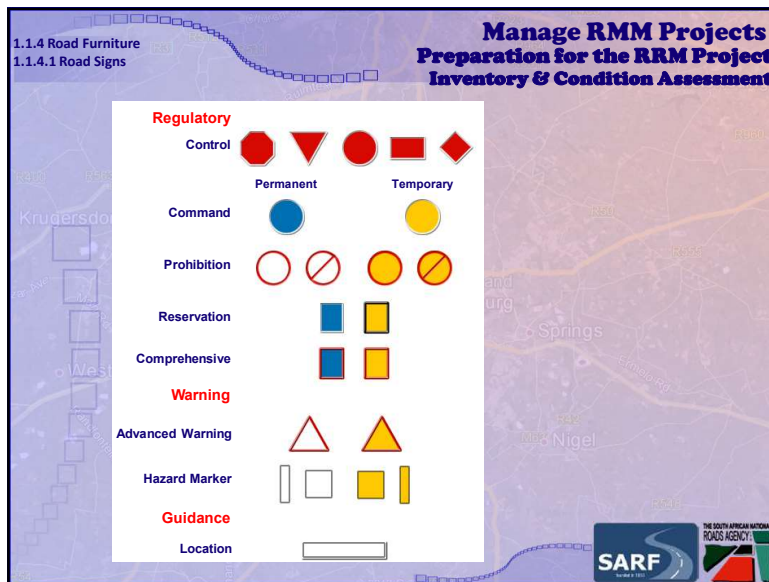
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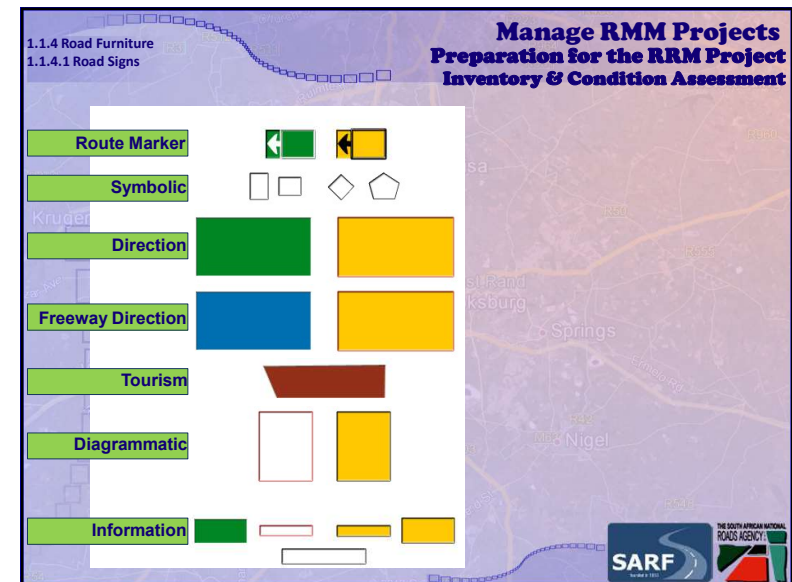
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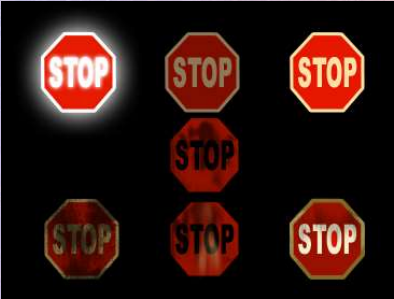
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1.1.4 Road Furniture
1.1.4.1 Road Signs

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment



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1.1.4 Road Furniture
1.1.4.1 Road Signs

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment

Information required				
Road signs	Information contained on sign (photo/copy of information)	✓		
	Location of road sign (coordinates)	✓		
	Size of road sign (surface area)	✓		
	Identification code at back of sign (write code)	✓		
	Type of road sign support	Timber	✓	
	Sign vertical	YES	✓	
	Undersides of sign horizontal	YES	✓	
	Height of undersides of sign from ground level		✓	
	All bolts in place	YES	NO	✓
	Road sign clean	YES	NO	✓
Night inspection: Visibility	Highly visible		✓	
	Intermediate visibility		✓	
	Poor visibility		✓	

Information checklist for road signs

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1.1.4 Road Furniture
1.1.4.1 Road Signs

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment



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1.1.4 Road Furniture
1.1.4.1 Road Signs

Manage RMM Projects Preparation for the RRM Project Inventory & Condition Assessment



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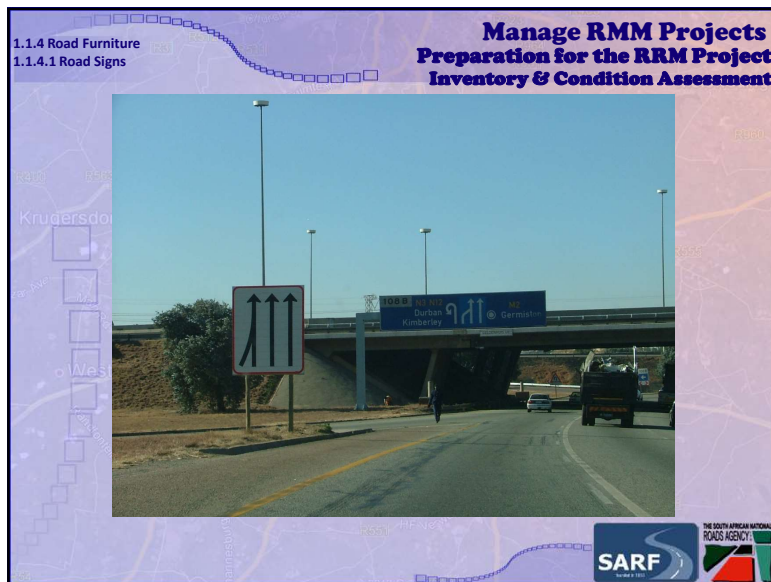
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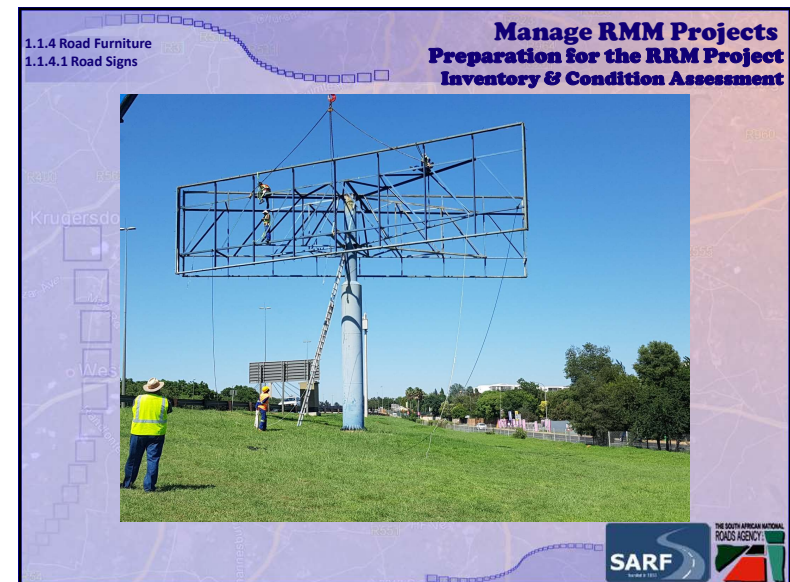
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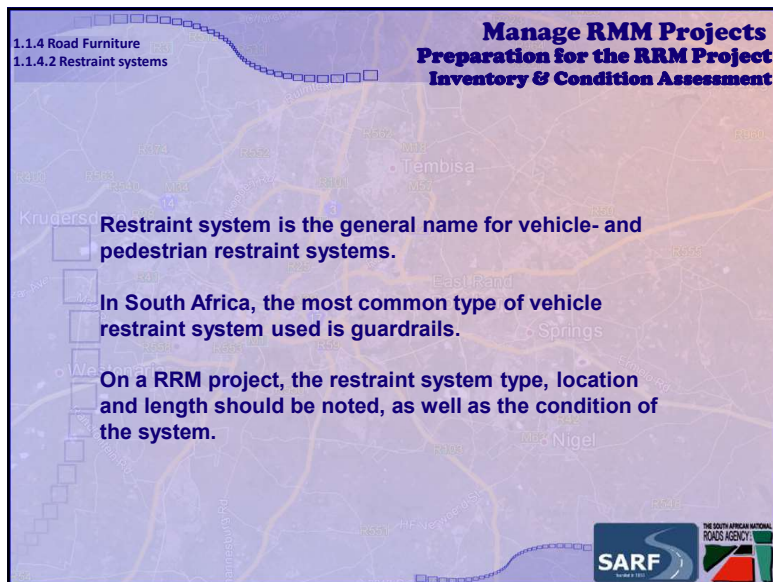
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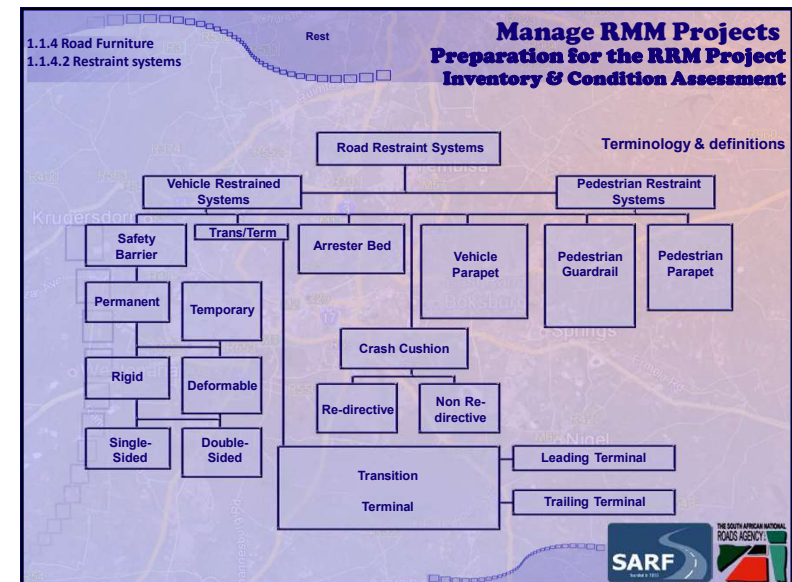
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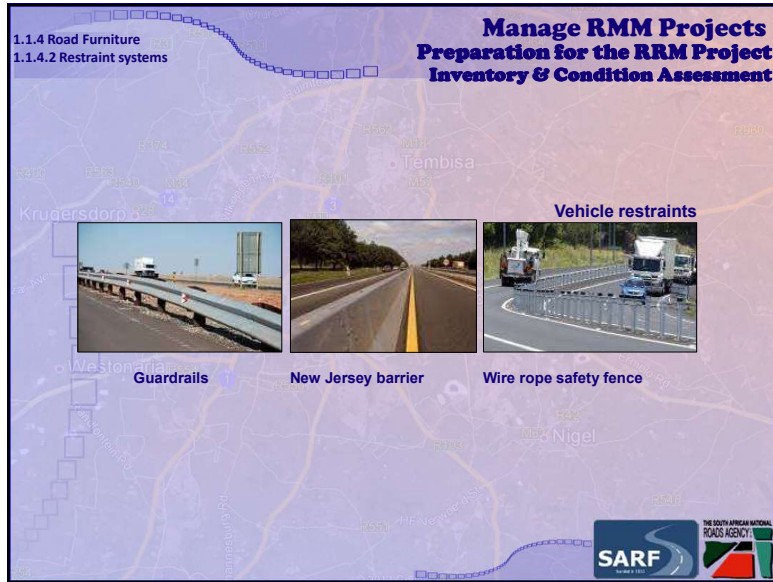
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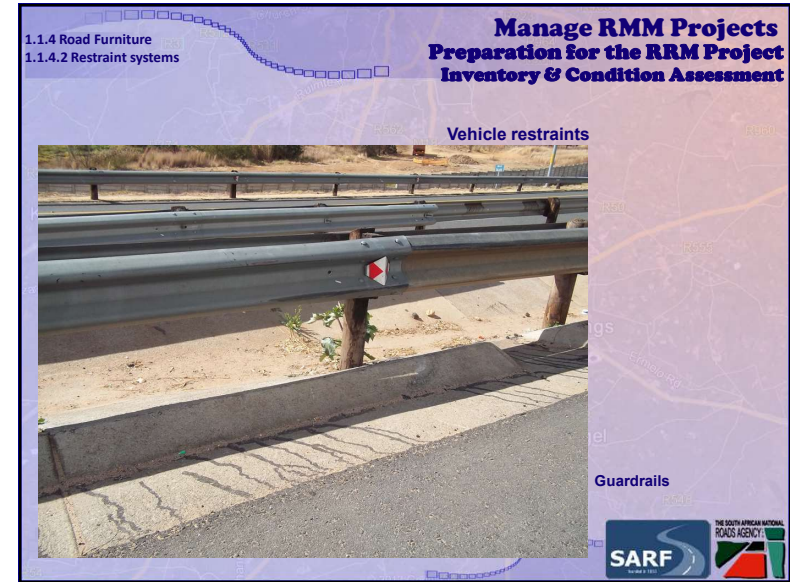
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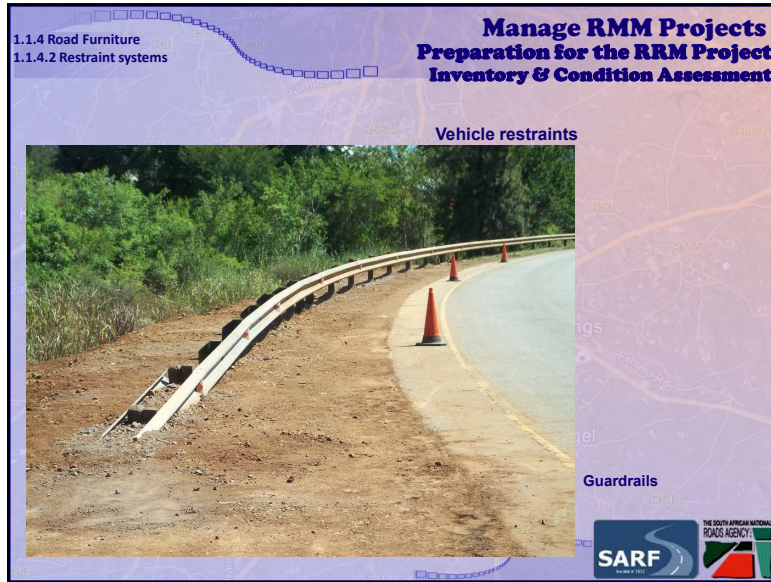
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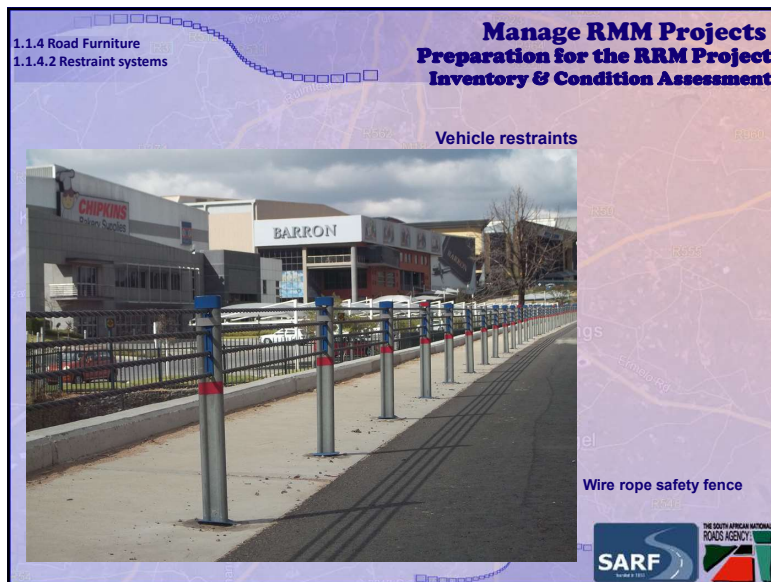
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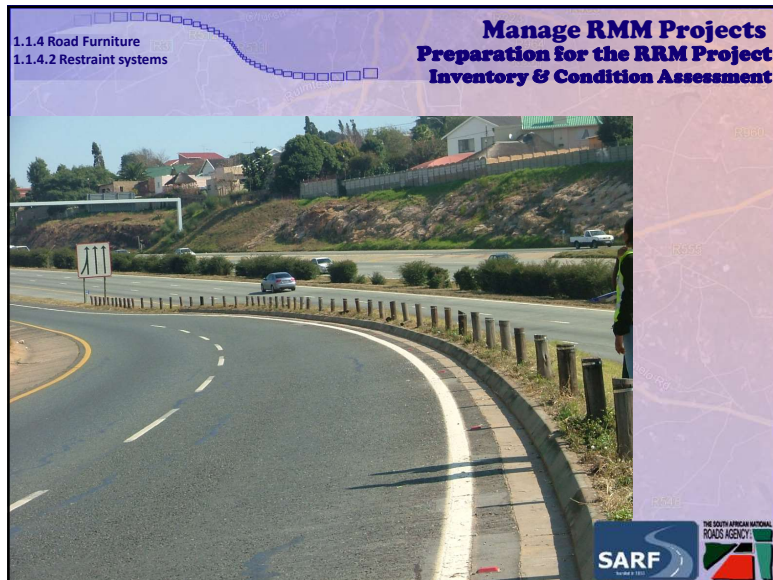
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Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment

1.1.4 Road Furniture
 1.1.4.2 Restraint systems

Information checklist for guardrails

Information required			
Guardrails	Location of system (start & end coordinates)	✓	
	New or new curved	✓	
	Alignment	Good ✓ Poor ✓	
	Height	Good ✓ Poor ✓	
	Posts	Backfill in soil ✓ Backfill in concrete ✓	
	End units	End wings ✓ Terminal sections with single guardrails ✓ Terminal sections with double guardrails ✓	
	Reflectors	New ✓ Missing N o ✓	
	Spacer blocks	New ✓ Missing N o ✓	
	All bolts tightened	Yes ✓ No ✓	
	Overlap	Yes ✓ No ✓	
		Distance (m)	✓

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Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment

1.1.4 Road Furniture
 1.1.4.2 Restraint systems

Information checklist for wire rope safety systems

Information required		
Wire rope safety	Location of system (start & end coordinates)	✓
	3-rope or 4-rope system	✓
	Alignment	Good ✓ Poor ✓
	Height	Good ✓ Poor ✓
	Post footings	Pre-fabricated ✓ Cast-on-site ✓
	Working width	✓
	Post distance	✓
	Wire anchor in line with fence	✓
	End fittings swaged	✓
	Wire ropes tensioned	✓

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Manage RMM Projects
Specific Outcome 1
Inventory & Condition Assessment

1.1.4 Road Furniture
 1.1.4.2 Restraint systems

Information checklist for pedestrian safety systems

Information required		
Pedestrian safety system	Type of pedestrian restraint system	✓
	Location of system (start & end coordinates)	✓
	Condition of system	Damaged ✓ Intact ✓
	If damaged, provide short description & location (coordinates)	✓
	Alignment of system	Aligned vertically ✓ Aligned horizontally ✓

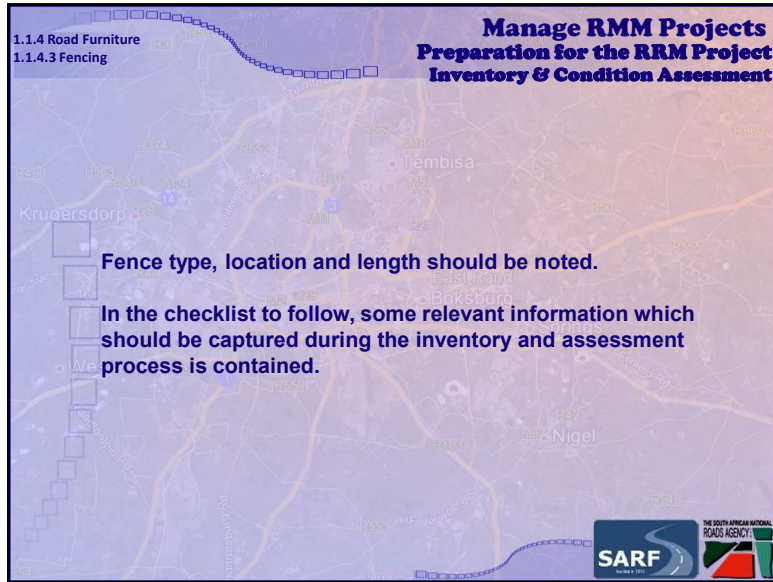
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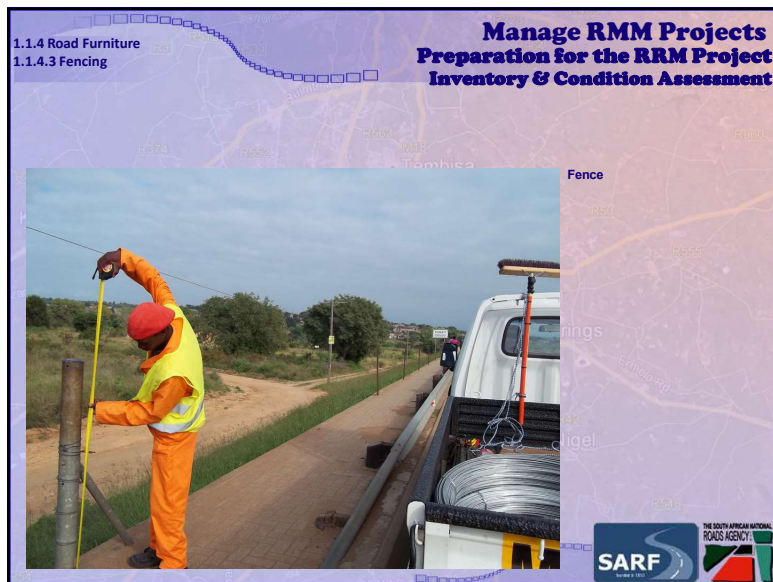
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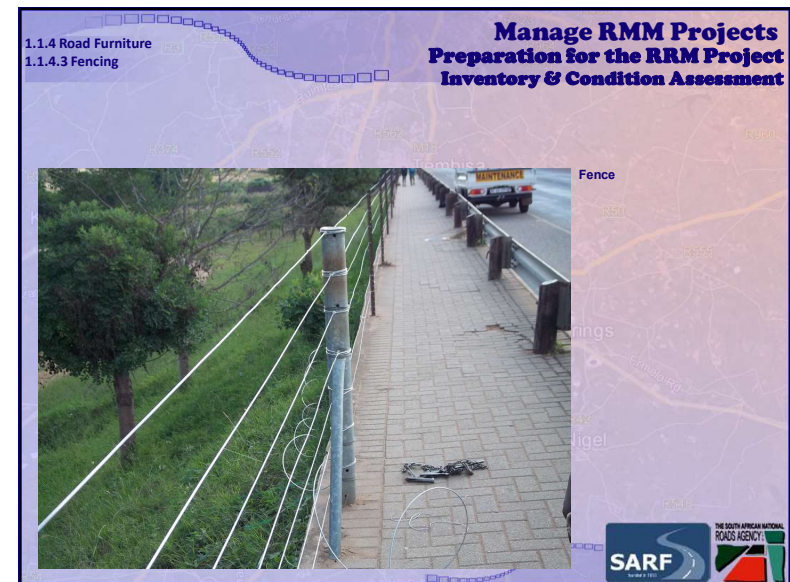
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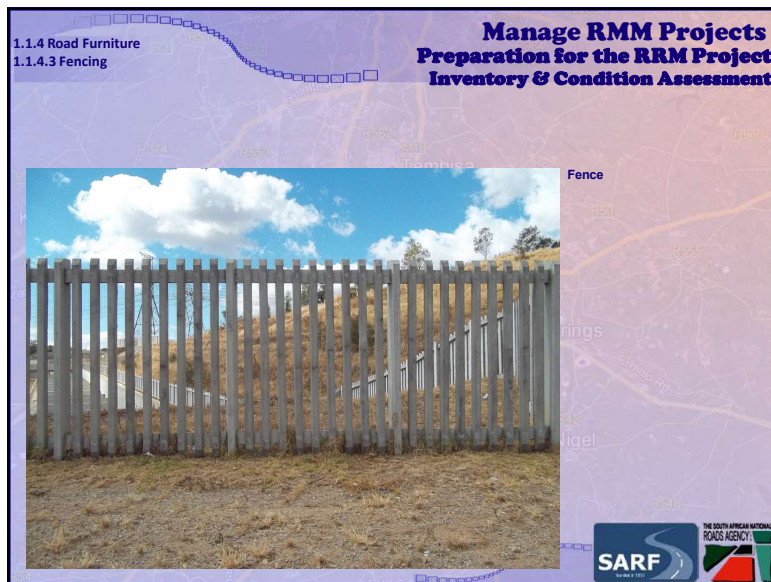
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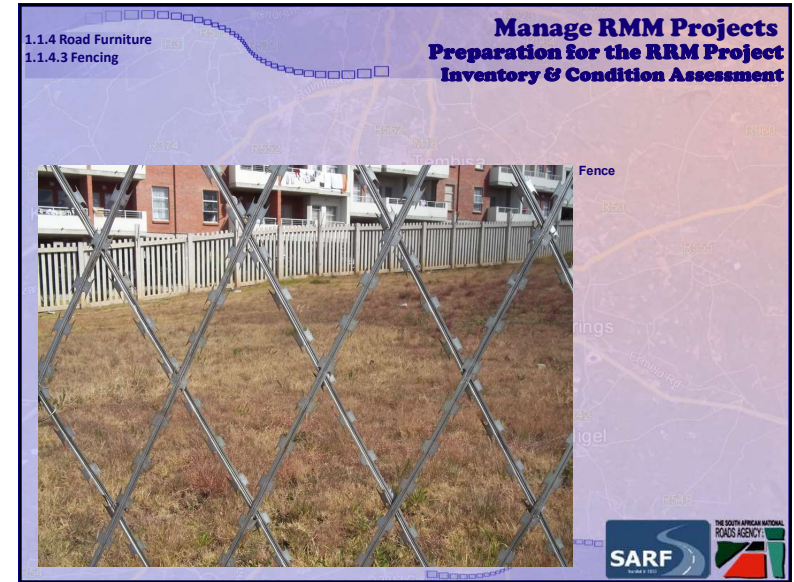
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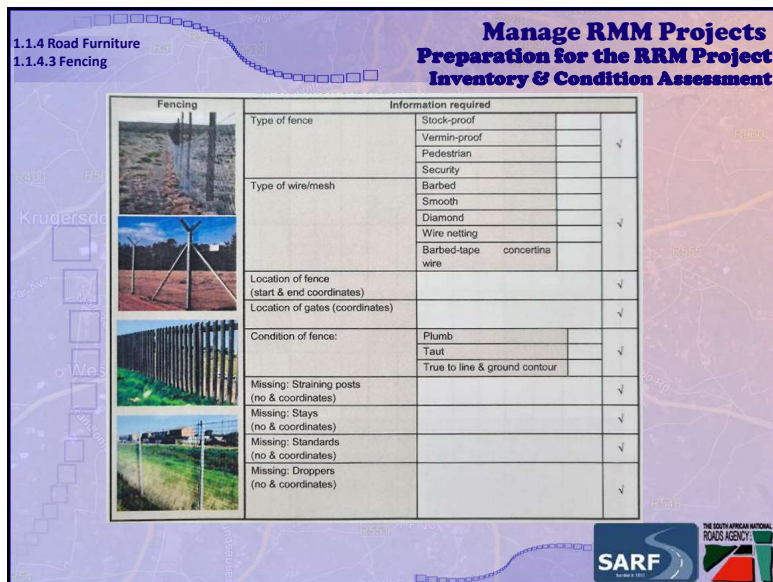
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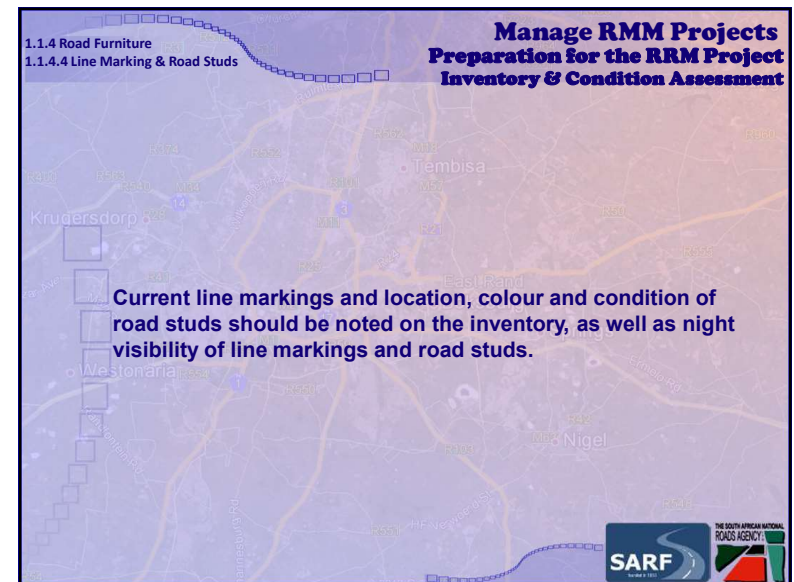
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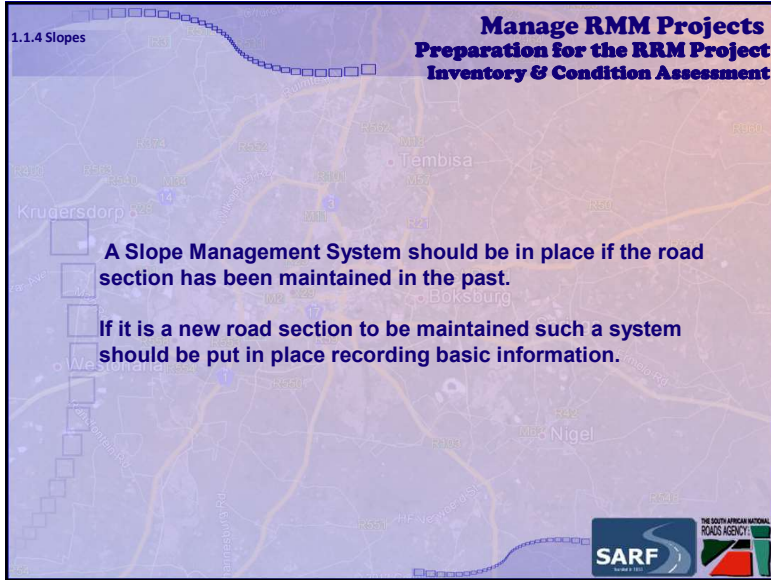
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.4 Slopes

A Slope Management System should be in place if the road section has been maintained in the past.

If it is a new road section to be maintained such a system should be put in place recording basic information.



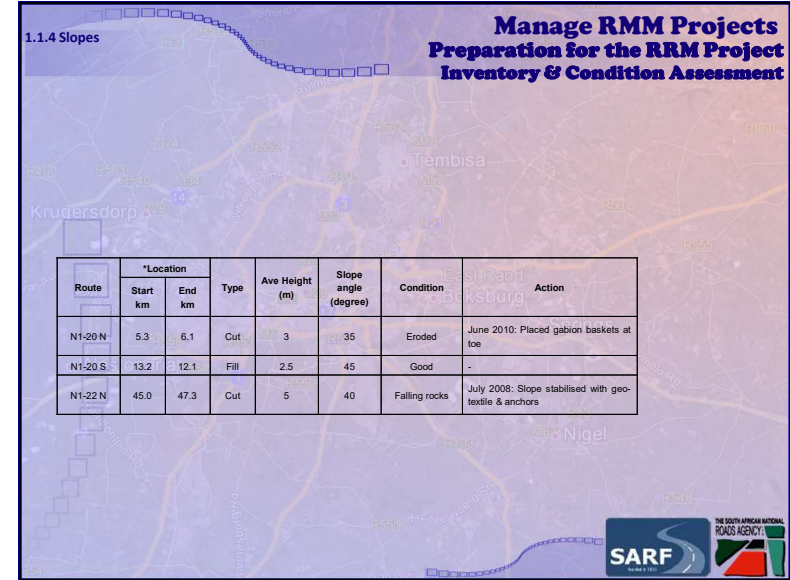
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.4 Slopes

Route	*Location		Type	Ave Height (m)	Slope angle (degree)	Condition	Action
	Start km	End km					
N1-20 N	5.3	6.1	Cut	3	35	Eroded	June 2010: Placed gabion baskets at toe
N1-20 S	13.2	12.1	Fill	2.5	45	Good	-
N1-22 N	45.0	47.3	Cut	5	40	Falling rocks	July 2008: Slope stabilised with geo-textile & anchors



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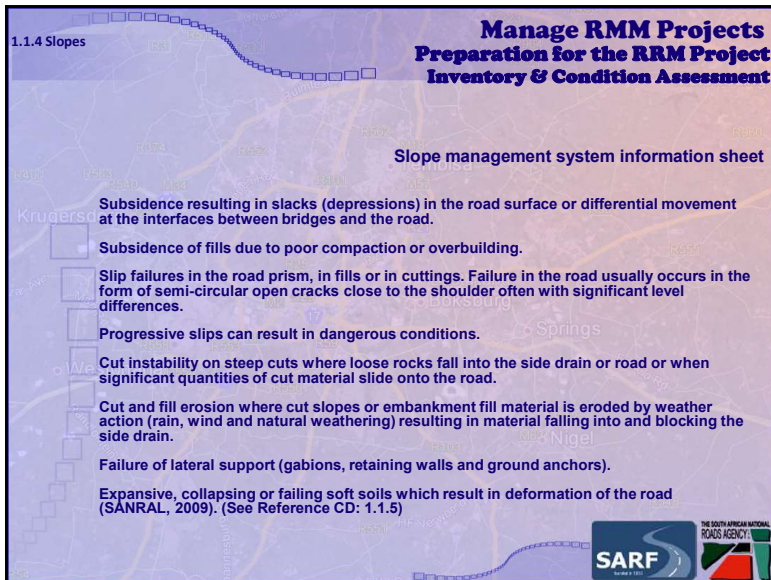
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.4 Slopes

Slope management system information sheet

- Subsidence resulting in slacks (depressions) in the road surface or differential movement at the interfaces between bridges and the road.
- Subsidence of fills due to poor compaction or overbuilding.
- Slip failures in the road prism, in fills or in cuttings. Failure in the road usually occurs in the form of semi-circular open cracks close to the shoulder often with significant level differences.
- Progressive slips can result in dangerous conditions.
- Cut instability on steep cuts where loose rocks fall into the side drain or road or when significant quantities of cut material slide onto the road.
- Cut and fill erosion where cut slopes or embankment fill material is eroded by weather action (rain, wind and natural weathering) resulting in material falling into and blocking the side drain.
- Failure of lateral support (gabions, retaining walls and ground anchors).
- Expansive, collapsing or failing soft soils which result in deformation of the road (SANRAL, 2009). (See Reference CD: 1.1.5)



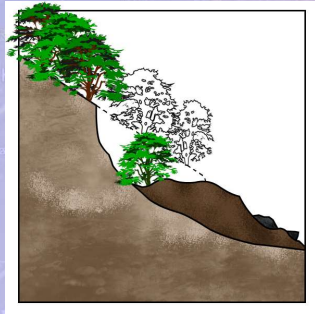

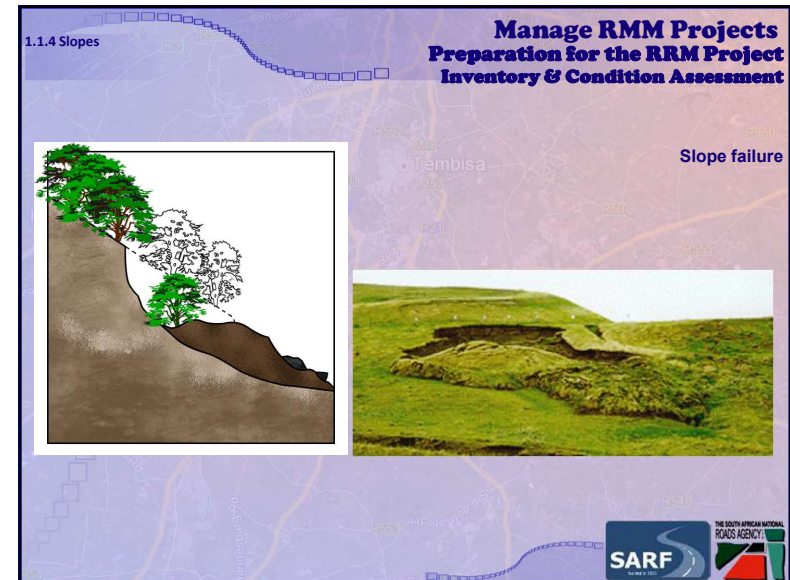
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**Manage RMM Projects
Preparation for the RRM Project
Inventory & Condition Assessment**

1.1.4 Slopes

Slope failure

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Preparation for the RRM Project
Inventory & Condition Assessment

1.1.4 Slopes

Slope stabilisation measures



Wire mesh Concrete

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Manage RMM Projects
Preparation for the RRM Project
Identify maintenance needs

**INVENTORY- & CONDITION ASSESSMENT SHOULD BE DONE
ACCORDING TO THE SPECIFICATIONS OF THE SPECIFIC ROAD
AGENCY**

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Manage RMM Projects
Preparation for the RRM Project
Identify maintenance needs

Upon completion or updating of the road section inventory and condition assessment, the maintenance needs of the road section should be identified.

This can be done in a number of ways depending on the agency, but generally maintenance needs can be identified by answering three basic questions.

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Manage RMM Projects
Preparation for the RRM Project
Identify maintenance needs

1.2 Identifying maintenance needs

Is the item a safety risk to the travelling public?

Will the action protect the road pavement and prevent further deterioration?

Does it fit into the overall agency strategy?

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Manage RMM Projects
Preparation for the RRM Project
Prioritise maintenance needs

1.3 Prioritise maintenance needs

Top priority is always to keep the road safe at all times. Situations which might result in accidents or cause damage to vehicles should be considered a maintenance need.

Actions which will prevent further deterioration of the pavement structure should be considered a maintenance need.

Strategies or long term planning which might be in place for a particular road section should be considered.

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Manage RMM Projects
Preparation for the RRM Project
Prioritise maintenance needs

1.3 Prioritise maintenance needs

Top priority is always to keep the road safe at all times. Safety of the public is always the top priority.

However, other situations, which can not be prioritised beforehand such as accident damage to guardrails, a slippery road surface due to spillage of some material by road users or poor visibility due to smoke from veld fires .

Budgetary constraints or strategies in place for a road section, will determine when priorities are attended to.

Generally it is good to think of road maintenance activities working from the centre line outwards. High priorities would be actions required on the carriageway or travelled way, and then would follow work within the road reserve.

Prioritisation is a recurring process.

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Manage RMM Projects
Preparation for the RRM Project
Prioritise maintenance needs

1.3 Prioritise maintenance needs

Identify maintenance needs on RRM contract (RRM contract staff)

Prioritise (Contract Engineer & RM)

Link cost to each maintenance need based on tendered rat& RM)

Compare cost of priority list with approved budget (Contract Engineer & RM)

Discuss priority list vs approved budget with client (Client, contract Engineer, RM)

Client to decide which items on list to complete with the approved budget (Client)

Which maintenance needs is to take preference

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Manage RMM Projects
Preparation for the RRM Project
Schedule prioritised needs & recurring maintenance activities

1.3 Prioritise maintenance needs

Which maintenance needs is to take preference

THERE ARE NO HARD AND FAST RULES TO APPLY WHEN PRIORITY IS GIVEN TO MAINTENANCE NEEDS.

COMMON SENSE ACCOMPANIED WITH BUDGETARY CONSIDERATIONS MUST PREVAIL.

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1.3 Schedule & recurring maintenance

**Manage RMM Projects
Preparation for the RRM Project
Schedule prioritised needs & recurring maintenance activities**

Scheduling of prioritised maintenance activities can not be done without considering the budgetary constraints of the project.

Therefore it is best to schedule activities after the cost of each activity was calculated using tendered rates, the budget was considered as well as the season or time of year.

This will then determine the cash flow and/or change the approved cash flow.

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1.3 Schedule & recurring maintenance

**Manage RMM Projects
Preparation for the RRM Project
Schedule prioritised needs & recurring maintenance activities**

Surfaced road maintenance

Maintenance	Always inspect	Start of dry season	During dry season	Start of wet season	During rain season	Always	Comment
Crack seal	✓		☺				Best noticeable if dry, seal all before start of rain season
Pothole repair temp.	✓					☺	Temporary repair to prevent accidents & bigger holes
Pothole repair perm.			☺				Sound pavement layer get damaged if rain should get into hole
Undulation repair			☺				All surfacing is dry season work
Surfacing (small)	✓		☺				All surfacing is dry season work
Re-shape shoulder		☺					The in situ moisture is useful, rain can cause havoc to traffic
Edge break			☺				Sound pavement layer get damaged if rain should get into hole

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1.3 Schedule & recurring maintenance

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Gravel road maintenance

Maintenance	Always inspect	Start of dry season	During dry season	Start of wet season	During rain season	Always	Comment
Camber			☺	☺			
Potholes			☺	☺			
Corrugations			☺	☺			
Gravel thickness			☺	☺			
Sand traps			☺	☺			
Exposed pipes	✓		☺	☺		☺	
Blocked pipes	✓		☺	☺		☺	

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1.3 Schedule & recurring maintenance

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Road drainage maintenance

Maintenance	Always inspect	Start of dry season	During dry season	Start of wet season	During rain season	Always	Comment
Side drains	✓		☺	☺		☺	
Cross drainage Culvert	✓		☺	☺		☺	
In- and out-lets	✓		☺	☺		☺	
Culvert natural flow	✓		☺	☺		☺	
Mitre banks	✓		☺	☺		☺	
Mitre berms	✓		☺	☺		☺	

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1.3 Schedule & recurring maintenance

Road furniture maintenance

Maintenance	Always inspect	Start of dry season	During dry season	Start of wet season	During rain season	Always	Comment
Road marking	✓					☺	
Road studs	✓					☺	
Guardrails	✓					☺	
Chevrons	✓					☺	
Signboards	✓					☺	
Fencing	✓					☺	
Km markers	✓					☺	

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1.3 Schedule & recurring maintenance

Road verge maintenance

Maintenance	Always inspect	Start of dry season	During dry season	Start of wet season	During rain season	Always	Comment
Grass shoulder cut			☺				
Grass cut road reserve			☺				
Bush clear						☺	
Tree remove						☺	
Lay-bys						☺	
Weed killer			☺				

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1.3 Schedule & recurring maintenance

It is clear that the most active maintenance period is during the dry season and at the start of the wet season.

Maintenance actions which must always be undertaken are those that are critical to ensure the safety of the public.

It is advisable that maintenance programs should be re-visited at the start of the RRM contract to ensure it is applicable to the specific climatic region and relevant conditions of the contract.

The RM must be aware of the risks of each maintenance activity and the corresponding mitigating measures which must be taken.

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Manage RMM Projects

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